EDITORIAL

Decision analysis in Transportation 2025

Análise de decisão em Transportes 2025

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The contemporary challenges of Transportation Engineering demand solutions that integrate multicriteria, uncertain scenarios, and diverse perspectives of decision-makers. Decision Analysis, by providing structured methods and multicriteria support tools, has proven particularly relevant for addressing complex problems, both in transport infrastructure and in the operation of mobility systems.

This special section of Transportes brings together contributions that demonstrate how such approaches can enhance planning, management, and evaluation processes, leading to more rational and technically and economically consistent decisions.

The first article presents a hybrid methodology (SMART and TOPSIS) for classifying asphalt mixtures, offering a practical alternative to the Flow Number defined in the Brazilian MeDiNa pavement design method. The study shows that, using five indicators for this classification, it is possible to reduce the need for extensive laboratory tests, streamline pavement design, and broaden access to feasible solutions, especially for low-volume roads.

The second article applies Life Cycle Cost Analysis (LCCA) to state highways in Ceará, combining this technique with decision trees to define maintenance and rehabilitation strategies. The results highlight the progressive deterioration of the road network and emphasize that delayed interventions lead to significantly higher costs. The research demonstrates LCCA as a fundamental tool for efficient allocation of public resources, promoting greater transparency and rationality in decision-making processes.

The third article proposes an optimization model for locomotive allocation to train movements, using mixed-integer linear programming. Applied at MRS Logística S/A, the approach achieved improvements in fleet availability, utilization, and energy efficiency, with reductions in fuel consumption and increases in overall asset effectiveness. Beyond validating the feasibility of optimization models in railway operations, the study points to promising directions for enhancing the competitiveness of the Brazilian rail transport sector.

Additionally, the role of new technologies and the integration between academia, the public sector, and the private sector in the evolution of decision analysis practices in transportation deserves to be highlighted. The articulation among the various actors strengthens the transfer

of scientific knowledge into practice. It enables the broader use of innovative tools to anticipate future scenarios and propose more resilient solutions. In this way, the articles submitted in response to this call for papers also reinforce the importance of interdisciplinary collaboration so that Decision Analysis can achieve concrete and lasting impacts on society.

Taken together, the articles selected for this special section, submitted in response to a call for papers, demonstrate how Decision Analysis can be applied across multiple dimensions – from asphalt mixture design to road maintenance and railway operations – expanding the ability of managers to devise strategies based on multiple criteria, reliable data, and long-term perspectives. We believe the contributions presented here not only strengthen academic knowledge but also provide concrete support for professional practice and public policy in the transportation sector.