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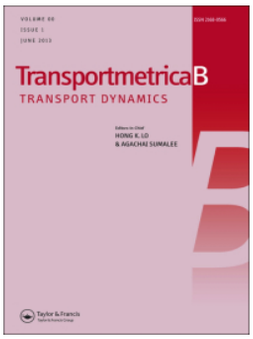

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Special issue on "Reliability and resilience of emerging mobility systems", an editorial note

Oded Cats [a,b], Sybil Derrible[c] and Joseph Chow [d]

[a]Department of Transport & Planning, Delft University of Technology, Delft, The Netherlands; [b]Division of Transport Planning, KTH Royal Institute of Technology, Stockholm, Sweden; [c]Civil and Materials Engineering Department, University of Illinois Chicago, Chicago, IL, USA; [d]Department of Civil & Urban Engineering, New York University Tandon School of Engineering, New York, NY, USA

ABSTRACT

This Editorial Note accompanies the special issue devoted to the development of new concepts, theories and methods that address reliability and resilience related to the planning, dynamic operation, and level of service of novel mobility systems. This special issue on âĂŸReliability and Resilience of Emerging Mobility SystemsâĂŹ consists of seven papers which are dedicated to methodological and theoretical developments as well as advanced applications in this domain. Several of the contributions originated from works presented at INSTR2021 (the 8th International Symposium on Transport Network Reliability). In this Editorial note we reflect on the contributions made in each of the articles included in this special issue.

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Network robustness; service reliability; disruptions; travel time variability

The key trends in transport – vehicle electrification, vehicle automation and shared service provision – change in fundamental ways the mobility landscape. In part, these trends lead to new ways of organising well-established modes of transport, distributing resources and managing vehicle fleets, as well as offering new modes of transport. Such developments have the potential to contribute to reducing the externalities associated with the transport sector. This calls for the development of new concepts, theories and methods that address reliability and resilience related to the planning, dynamic operation and level of service of novel mobility systems.

This special issue on 'Reliability and Resilience of Emerging Mobility Systems' consists of seven papers which are dedicated to methodological and theoretical developments as well as advanced applications in this domain. Several of the contributions originated from works presented at INSTR2021 (the 8th International Symposium on Transport Network Reliability) which took place online due to the pandemic. The contributions made by the papers included in this special issue span from developing or specifying indicators of criticality and travel time reliability, through models of service reliability and post-disruption effectiveness, to assessing the robustness of train timetables.

The analysis of network vulnerability often involves the identification of the most critical network elements. Du, Jiang, and Chen (2022) develop a new link criticality indicator that is applicable to multimodal transport networks. The indicator measures link criticality in terms of the amount of network-wide capacity reduction in the event that they are disrupted. The authors address the computational burden of performing a full-scan disruption analysis by proposing an approximation approach. While

CONTACT Oded Cats o.cats@tudelft.nl Delft University of Technology, Delft, The Netherlands; KTH Royal Institute of Technology, Stockholm 2628CN, Sweden

most works in the realm of network vulnerability and robustness focus on the ability of systems to withstand disruptions, Xu, Zhang, and Chopra (2022) evaluate the impacts of post-disruption response measures. In particular, they study alternative re-routing options for bus services using a simulation of node percolation processes and the analysis of degradation curves.

The structure of transport networks is the outcome of their unique evolution. Ameli, Lebacque, and Leclercq (2022) show how the robustness of a multi-modal network has the marks of its historical development. Their findings can inform (public) transport network planners in regard to the impact of design choices on future network robustness. The analysis of transport service robustness is not limited to topological and service availability aspects. A robust design of service operations involves the consideration of potential disturbances also at the timetable planning phase. Artan and Şahin (2022) examine the ability of a railway timetable to recover in response to unplanned events. They use a Markov chain model to capture the uncertainty of train operations and mimic the evolution of train delays. Similarly, uncertainty in service operations is also critical in determining service reliability in the context of emerging shared fleet systems. Yao and Schmöcker (2022) use an agent-based simulation model for studying the uncertainties associated with free-floating services and the related user responses. The proposed model enables testing for the impact of various information-seeking and reservation strategies on system performance, including the likelihood of accessing a desired vehicle, and applied to a bike-sharing scheme.

Finally, this special issue includes articles that contribute to the specification and measurement of travel time reliability. Travel time reliability is often measured in terms of the share of trips for which a certain travel time threshold is exceeded. In practice, there is a large variation in how such a threshold is determined. Zang (2022) proposes a method for determining the travel time threshold based on the ratio between observed travel times and travel times under free-flow conditions while balancing between traffic efficiency and travellers' travel costs. The field measurement of travel time reliability is performed using data from traffic sensors, the deployment of which is constrained by budget considerations. Fu et al. (2022) propose a method for optimising the locations of traffic sensors with the goal of estimating link travel time. The proposed method takes the correlation between travel times on different links into consideration to improve the estimation accuracy of both the mean and covariance of link travel times.

The articles included in this special issue provide methodological advances to the state of the art on reliability and robustness of emerging mobility systems. We thank the authors for their contributions and the referees for their rigorous reviews. We also thank the journal's editor-in-chief, Prof. Hong Lo, for his consistent support throughout this process.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Oded Cats http://orcid.org/0000-0002-4506-0459
Joseph Chow http://orcid.org/0000-0002-6471-3419

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