

From	Time	Plat	Due
Stansted Airport	07:08		Cancelled
Stansted Airport	07:20		Cancelled
Clacton on Sea	07:20		Cancelled
Norwich	07:37		Cancelled
Braintree	07:48		Cancelled
Clacton on Sea	07:51		Cancelled
Stansted Airport	07:56		Cancelled
Clacton on Sea	08:06		Cancelled

Resilience in railway transport systems

Problem description

Today urban mobility becomes more fragile to unexpected events in the networks. In the Netherlands, on average, about 14 of such disruptions occur every day. Such disruptive events may range from failures of infrastructure and vehicles, engineering works, adverse weather (rain, snow storm, wind, earthquakes, floods, and hurricanes) to random and tailored attacks. Many of them create problems spreading all over the network causing many cancelled and heavily delayed trains leading to great dissatisfaction of passengers. For example, on 22 August 2018, infrastructure failures caused that almost no trains run through the Schiphol tunnel for most of the day affecting tens of thousands passengers (<http://tiny.cc/Schiphol>).

Therefore, it is crucial to understand and quantify potential impacts on railway networks, be better prepared and take greater attention before disruptions occur. In addition, the railway system could take into account such disruptions to improve resilience of future railways. This can include new infrastructures, better operations and information provision to passengers. Finally, knowing critical elements would lead to better allocation of emergency teams and additional resources in order to respond faster to future disruptions.

Possible research topics

- Develop quantitative and qualitative indicators to measure resilience of railway systems
- Analyse impacts of planned and unplanned disruptions (e.g. failures, adverse weather)
- Improve infrastructure against climate changes
- Infrastructure recovery after disruptions and disasters
- Develop contingency plans
- Plan replacement services
- Determine critical elements in the networks
- Develop resilient timetables that resist the most critical disruptions

Reference

Bešinović N., (2020) Resilience in railway transport systems: a literature review and research agenda, *Transport Reviews*, <https://doi.org/10.1080/01441647.2020.1728419>

Background

A student is expected to have knowledge and interest in quantitative techniques such as data analysis, mathematical optimization, machine learning and/or simulation. The project can be conducted as final thesis project or research project.

Information

- Digital Rail Traffic Lab (DRTLlab) www.tudelft.nl/drtlab/
- Dr. Nikola Bešinović (n.besinovic@tudelft.nl) and Prof. dr. Rob Goverde