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Editorial

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Editorial

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Welcome to this themed issue of *Transport* on 'innovation in railway civil engineering', which is published at an exciting time for the worldwide rail industry. Whilst the Covid-19 pandemic and the consequent economic slowdown will reduce demand in the short term, all the signs are that demand will recover, and that rail will continue to make a significant contribution to connecting people, businesses and places.

Railway infrastructure operators across the world face two major challenges:

- increasing the capacity and capability of their networks to meet the continuing growth in demand for both freight and passengers; and
- 'decarbonisation' of rail operations.

Globally, passenger and freight usage has increased steadily in the period 2004–2017 (UIC, 2020). The extent of growth varies from region to region; however, in both passenger journeys and freight deliveries growth in Asia has been significant. Driven by developing Asian economies this growth is manifested in the expansion of high-speed passenger networks and the development of a rail-based supply chain from China to Europe – the new Silk Road (Railfreight.com, 2020).

The UK government has committed to net zero greenhouse gas emissions across the economy by 2050 (BEIS, 2019). It is likely that some sectors, for example agriculture and aviation, will not be able to achieve zero carbon dioxide, and will rely on carbon dioxide off-setting to meet the net zero target.

The transport sector accounts for a significant proportion of global carbon dioxide generation and it is probable that land transport will need to achieve gross zero emissions in order to release the limited off-setting capability to other sectors. It is clear that modal shift of both passengers and freight to rail will be an essential element of the path to zero carbon dioxide. In the UK, the required long-term road freight emissions reduction can only be achieved by strategically shifting freight on to rail (Pantelidou *et al.*, 2016).

Rail networks are capital intensive and must compete for investment funds with other essential infrastructure developments. Confidence that investment in rail is value for money is essential to secure the funds to upgrade and enhance rail networks – and to build that investor confidence the rail industry must develop more innovative, efficient and effective ways of working.

This themed issue contains papers addressing innovation in strategy development, describing case studies from recent UK projects and introducing new tools and techniques.

In order to maintain and enhance existing rail networks engineers need uninterrupted access to the track: 'a possession'. As freight and passenger demand increases, more trains operate on the network, which in turn reduces the time available for engineers to take possession of the track. In the UK as a consequence, operators are more likely to challenge Network Rail (NR) to find creative solutions to deliver infrastructure programmes (Algaard and Lines, 2020).

Armstrong and Preston (2020) review the existing NR engineering access regime and discuss an improved process. The authors propose to make better use of data to assess the trade-off between efficiency of maintenance, renewal and enhancement works (from longer possessions) and improved freight and passenger rail operations (from shorter possessions).

To enable the UK to achieve zero carbon dioxide emissions from rail a rolling programme will be required to extend rail electrification across the majority of the network. This is likely to amount to 10 000 single track kilometres to be electrified (Clarke, 2020), and each kilometre of electrified route will require a number of masts to support the overhead line equipment.

Haiderali (2020) describes the application on the North West Electrification Project of an innovative approach to the design of mast foundations in an area underlain by historic mine workings. A combination of finite-element analysis and on-site monitoring of installed foundations was used, which reduced the number of ground investigation boreholes required and resulted in significant programme and cost savings.

Another risk-based approach was applied to the management of NR earthworks in East Anglia and is described by Payne *et al.* (2020). Budget constraints incentivised NR's framework partners to focus interventions more effectively, which allowed the release of capital expenditure for interventions at more sites across the region.

Earthwork failures of the types described by Payne *et al.* are frequently first observed through settlement or distortion of the railway tracks in the vicinity. A new technique for determining track stiffness by measuring displacement under load is presented by Gallou *et al.* (2020). The video gauge uses digital image correlation to record track movement. A particular benefit of this technique is that it requires very limited access to the track, reducing both safety risk to surveyors and disruption to trains.

Nyambayo *et al.* (2020) describe the geotechnical aspects of a rail widening project in East London, including bridges, stations and overhead line equipment mast foundations. One particular challenge was the construction of a rail bridge over a shallow-depth cast-iron water main in close proximity to an existing road overbridge and a London Underground rail tunnel.

The rail industry has access to large quantities of data, the challenge is converting this data into useable information. Arnall *et al.* (2020) propose the application of a data mining technique to establish correlation between locations with low adhesion (wheel slips) and sites of rail defects caused by rolling contact fatigue.

Finally, Watson *et al.* (2020) discuss the sustainability of high-speed rail with reference to three current projects:

- Rail Baltica, northern Europe
- California High-Speed Rail, USA
- High Speed Two (HS2), UK.

They rank the economic, environmental and society benefits of each project. Of the three projects, none scores 'strong' in economic sustainability. Further comparison is made by means of data envelopment analysis, which ranks projects by technical efficiency. This analysis indicates that Rail Baltica is less technically efficient than either HS2 or California High-Speed Rail.

I am sure you will find these papers thought provoking, and I encourage you to engage with the authors through the discussion process.

REFERENCES

Algaard EM and Lines RD (2020) Railway infrastructure portfolio management in the UK. *Infrastructure Asset Management* **7(1)**: 15–24, https://doi.org/10.1680/jinam.18.00012.

Armstrong J and Preston J (2020) Balancing railway network availability and engineering access. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 209–217, https://doi.org/10.1680/jtran.19.00045.

Arnall AD, Fletcher DI and Lewis R (2020) Geospatial and temporal data mining to combine railway low adhesion and rail defect data. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 273–286, https://doi.org/10.1680/jtran.17.00120.

BEIS (Department of Business, Energy and Industrial Strategy) (2019) https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law (accessed 11/06/2020).

Clarke D (2020) Rail Industry Association presentation. *Webinar: Achieving Rail Decarbonisation by 2040 – Where are We Now and What are the Next Steps?* See https://www.waterfrontconferencecompany.com/conferences/webinar-achieving-rail-decarbonisation-by-2040-where-are-we-now-and-what-are-the-next-steps (accessed 25/06/2020).

Gallou M, Frost M, El-Hamalawi A and Hardwick C (2020) The application of track deflection measurements made by video gauge. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 245–257, https://doi.org/10.1680/jtran.18.00003.

Haiderali AE (2020) Mitigation of ancient coal mining hazards to overhead line equipment structures. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 218–231, https://doi.org/10.1680/jtran.18.00143.

Nyambayo V, Chandrashekharaiah N, Gray C *et al.* (2020) West Anglia main line upgrade – a geotechnical perspective. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 258–272, https://doi.org/10.1680/jtran.19.00096.

Pantelidou H, Casey G, Chapman T, Guthrie P and Soga K (2016) Re-thinking UK transport emissions – getting to the 2050 targets. *Proceedings of the Institution of Civil Engineers – Civil Engineering* **169(4)**: https://doi.org/10.1680/jcien.15.00076.

Payne I, Clifton L, Holt S, Griffiths I and Wadesmith D (2020) Ground risk and rail asset management in East Anglia. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 232–244, https://doi.org/10.1680/jtran.19.00047.

Railfreight.com (2020) New Silk Road in 2019: more trains, less empties and lots of politics. *Railfreight.com*, 30 December. See https://www.railfreight.com/specials/2019/12/30/new-silk-road-in-2019-a-wrap/ (accessed 11/06/2020).

UIC (2020) https://uic.org/support-activities/statistics/#Rail-transport-in-the-world (accessed 11/06/2020).

Watson I, Ali A and Bayyati A (2020) Sustainability of high-speed rail: a comparative study. *Proceedings of the Institution of Civil Engineers – Transport* **173(4)**: 287–296, https://doi.org/10.1680/jtran.18.00131.