Universities boost road management technologies

In a parallel to the Live Labs, ADEPT is supporting some innovative schemes aimed at demonstrating the scope for ITS-based technology in better roads management. David Crawford reports

In Staffordshire, nearly £2m of Government cash is helping to create a ‘living lab’, ‘smart’ road network on the research-led Keele University’s small-town campus, which sits within 240 hectares of countryside. The largest single-site campus in the UK, this has for some time run its own private street network, which connects the homes of over 3,000 students, some 200 private households, and businesses employing around 1,000 people. The scheme will also support the Keele Deal plan to attract £70m of new investment in the university by regional authorities and hospitals.

It aims to show how introducing modern ITS techniques could improve existing on-campus traffic flows and, in the process, explore ways in which ‘smart highway’ concepts already being developed, e.g. on the neighbouring M6, could be scaled down to a neighbourhood level.

The scheme will latch onto the university’s smart energy network demonstrator (SEND), launched in June 2016 to underpin the operation of the campus with a decentralised network that will monitor consumption and indicate potential cost savings.

Keele is teaming up with partners Staffordshire CC, its highways contractor Amey and consultants Urban Integrated, as well as local technology firms, while students will be involved as part of their degree courses.

The intended result is the continuous monitoring of traffic movements around the campus, with the resulting data being used to reduce congestion and crashes, improve air quality and enable the earlier detection of damage to roads.

The project sits within a sub-regional growth corridor, plans for which were unveiled in 2018 in response to Newcastle-under-Lyme BC’s known and forecast household needs. These include a network of semi-rural walking routes leading to a potential new public transport hub strategically located in order to discourage private car use.

The heavily wooded environment (see picture) will remain as part of the natural landscape. There are also expectations of worthwhile outcomes for ITS deployment in rural and semi-rural areas throughout the country.

An integral feature will be a purpose-designed control centre to manage all the individual operations and act as a data broker between them. This is also being envisaged as a platform for testing relevant new transport and environmental technologies – as far as possible on a plug-and-play basis. It will be led by data from sensors deployed across the campus road and energy networks.

Another £3.95m ADEPT project, which Staffordshire is sharing with Kent CC and the University of Birmingham,
involves developing a local highway asset management, central digital hub.Linked to a set of dynamic network sensors attached to individual elements ranging from drainage systems to winter service equipment, this aims to deliver more cost-efficient highways maintenance.

To the South, the University of Birmingham has teamed up with a swathe of local authorities including Birmingham and Solihull, as partners in a Transport for West Midlands (TfWM) project. They are progressing a £2.6m scheme designed to collect, analyse and model traffic data from a series of video analytics pilots being run on specified road corridors.

It will be able to map point-to-point vehicle journey times during a range of usage time windows, using automatic number plate recognition.

The data collected will keep travellers informed via local highway authority variable message signs, commercial services such as Google and Citymapper, and vehicle manufacturers’ navigation products. The result will help users to decide whether to retime, reroute, replan or even abandon journeys in times of disruption.

Additional study areas could include the monitoring of pedestrian and bike movements, the latter with the aim of informing planned roll-outs of bikesharing, which TfWM is committed to continue supporting despite experiencing recent problems.

Housebuilding demands are a key factor in a ‘live lab’ project bringing together the University of Reading with Siemens and four Berkshire local authorities in response to plans to build substantial numbers of new homes during the next 10 years – with parallel provision for employment growth. This is a sub-region where critical infrastructure is already coming under pressure.

The scheme involves fusing live and historic data from sources including traffic signals, Bluetooth journey time devices and private and public transport network operations. The aim is to create a multimodal view of real-time movement across the Thames Valley and, not least, to create the right conditions for connected and autonomous vehicle deployment.

The partners plan to develop a replicable commercial model that could offer scope for revenue opportunities for the local authorities involved.

Across all the ADEPT projects, a recently developed smart collaboration hub will enable individual teams to share information and lessons learned as they progress.

In a further showcasing of academic proactivity, the July 2019 annual conference in Leeds of the Universities’ Transport Studies Group (UTSG) highlighted a decision-support tool developed by researchers at the University of Strathclyde for optimising the recovery of road networks after major (but not catastrophic) travel dislocations.

Their starting point is the fact that most previously developed road recovery models are designed to cope with catastrophic events, on the scale of earthquakes and hurricanes. With these, safe evacuation, search-and-rescue and relief distribution are the key short-term needs, with repair of the infrastructure the main long-term concern.

This approach does not, however, necessarily reflect the impacts of lower-risk, weather-related hazards, such as landslides, floods and high winds, indicating the need for alternative models. Using as a real-case scenario the landslide-prone north-west of Scotland, the team has created one that combines the infrastructural repair process with the need to deliver decision-making support for drivers facing network-changing conditions. Their options can be influenced by real-time information being made available via a range of sources (see table).

The researchers believe that their work has created the first insight into a road recovery model for the future. Future research areas will include the scope, where available, for multi-modal options for stranded travellers.

A second UTSG group, from the University of Southampton, has demonstrated that introducing narrower highway lanes dedicated for use by connected and automated vehicles (CAsVs), with their higher road space needs, could generate construction cost savings of £0.5m for every km of length.

The results also indicate that, on motorways, nearly 0.4 crashes per km per year could be prevented if 25% of the HGVs using them had CAV capability. Also, worthwhile scope for fuel efficiencies and reductions in CO2 emissions has emerged.