5G-Enabled Roads

The economic, social and environmental costs of traffic congestion are becoming increasingly well known. One solution for easing this issue is via increasing the effectiveness of traffic monitoring by moving from traditional manual monitoring methods to using 5G-enabled systems to efficient and responsive traffic management services. The below example details how West Midlands 5G (WM5G), Vivacity Labs and Jacobs used 5G technology to enable the UK's first 5G connected 'Road Sensor Network'.

1 Situation

The West Midlands currently experiences significant losses of productivity from high levels of congestion, with businesses in Greater Birmingham losing approximately £407m in revenue per annum. Congestion also impacts road safety by increasing incident response times.

With growing populations and an expanding transport network, these issues will become worse if left unaddressed.

2 Task & Action

The 5G sensors collect, process and share real-time traffic, emissions and weather data. The network of 280 sensors is centred around the Key Route Network (KRN), a set of A and B roads equivalent to 7% of the available network but which carry over half of all traffic within the region. The traffic data is used to divert buses, implement diversions and, in the future, could issue instant warnings to motorists. The data Is also used to analyse trends, assisting in transport planning and there is an opportunity for data commercialisation.

3 Results

Less time wasted in delays: The system reduced time spent stuck in traffic, saving the average commuter 7 hours a year, equating to productivity savings of £43.9m over 5 years.

Improved safety for vulnerable road users: Between 2016 and 2019, there were 76 serious or fatal injury accidents across the KRN. Data from live video streams gather information on vulnerable road user movements and behaviour paths, informing the planning of features like pedestrian crossings.

Cleaner air: The system has the potential to reduce CO_2 emissions by 370,000 metric tonnes per year in the UK, due to the reduced time spent in congestion.

Predictive maintenance: 5G sensors have improved the ability to monitor road and asset condition and reduced the need for manual inspections.

4 Why 5G?

5G's combination of increased bandwidth, lower latency and greater resilience and ability to support more connections, allows multiple high definition camera images to be streamed securely and reliably. High data speeds enable the data captured to be anonymised and transferred to the regional control centre in near-real time, building a more accurate simulation of anticipated traffic and improving congestion management, whilst upholding GDPR laws. It supports the collection of a richer set of data including pedestrian and cycle movements and supports future evaluation of demand responsive transport. 5G also removes the need to locate fibre optic solutions in every location which is expensive and could disrupt the road network.

£407m loss in productivity revenue p/a for Greater Birmingham's businesses due to congestion

7 hours of every average commuter's time saved annually

370,000 metric tonne reduction in CO2 emissions possible per year from 5G enabled traffic monitoring (O2 UK, 2019)