Shaping the Future of Mobility: Adaptive, Connected and Resilient Transport in Milton Keynes

Milton Keynes is rewriting its transport DNA. Once designed as Britain's ultimate car city, it's now pioneering a radical shift towards intelligent, adaptive mobility that could blueprint the future of urban transport across the UK. With growing pressure on road space, the need for existing infrastructure to work harder without largescale infrastructure enlargement projects and increasing demands for multimodal integration, the design and operation of transport corridors requires a rethink. Advances in data collection, analytics, and smart infrastructure now offer powerful tools to understand movement patterns and deliver innovative mobility services. This paper explores how Milton Keynes is applying emerging technologies—including UTC, SCOOT® 8, AI, and connected vehicle infrastructure—to build a more adaptive, inclusive, and resilient transport ecosystem.

This transformation isn't just about technology, it's about reclaiming road space for people, cutting emissions by 30% by 2030, and ensuring no resident is more than 400 metres from sustainable transport options.

From Grid Roads to Smarter Streets: The Milton Keynes Challenge

Milton Keynes, established in the 1960s, was originally planned as a car-oriented city with a grid-based road network, expansive roundabouts, and decentralised development. While this design supported rapid movement and low congestion in its early years, the city is now grappling with growth, congestion, and the need for sustainability. Strategically located within the Cambridge–Milton Keynes–Oxford growth arc, it is forecast to grow to a population of forecast to nearly double from 270,000 to 500,000 residents by 2050, this is the equivalent to absorbing a city the size of Southampton.

To address these pressures, Milton Keynes has adopted a long-term Mobility Strategy (2018–2036) and a supporting Transport Infrastructure Delivery Plan (TIDP). As part of this strategy, the rollout of a citywide TRL Urban Traffic Control (UTC) system provides a digital backbone for coordinating multimodal movements and managing demand dynamically. This infrastructure ensures that future transport interventions are integrated, scalable, and responsive to evolving travel patterns.

Building the Digital Backbone: Real-Time Response with TRL UTC and SCOOT® 8

One of the key building blocks to this Infrastructure is TRL's UTC system, powered by SCOOT® - an adaptive signal control system that optimises traffic flow in real time based on live detector inputs. SCOOT® 8 enhances this foundation by integrating emissions-sensitive logic, public transport feeds, and multimodal prioritisation. These capabilities enable Milton Keynes to support bus service reliability, reduce emissions, and manage road space more intelligently. In practice, this means a bus running late triggers automatic green-light extensions along its route, whilst the system simultaneously adjusts surrounding junctions to prevent knock-on congestion

SCOOT® 8 introduces transformative capabilities through flow forecasting and AI-driven corridor-level predictions. These tools allow the city to anticipate congestion, particularly

during peak periods or special events, and respond proactively. Early anomaly detection also supports dynamic incident management without the need for constant operator input.

Predicting the Future: AI-Powered Traffic Management

Artificial intelligence is further shaping how Milton Keynes manages transport. TRL's AI models draw on historical data and real-time inputs from the UTC network to traffic issues up to 15 minutes before they occur, this gives enough time to address the problem before it becomes a problem! These tools enable proactive adjustments to signal timings and strategies to maintain network fluidity.

Beyond efficiency, AI is being applied to safety and behavioural monitoring. Camera-based systems now classify road users—including pedestrians, cyclists, and e-scooter riders—and track near-miss incidents and signal compliance. This data supports evidence-led changes to signal plans, particularly around schools and high-footfall areas, enhancing protection for vulnerable users.

Connecting Communities: Inclusive Transport for All

Milton Keynes is already laying the groundwork for the next generation of transport technologies — including connected and autonomous vehicles (CAVs) and vehicle-to-everything (V2X) communication. These projects marked some of the UK's first operational deployments of self-driving shuttles on public roads and laid the groundwork for future innovations. Whilst fully autonomous vehicles remain years away nationally, Milton Keynes' early infrastructure investments ensure it won't be left behind when the technology matures and presents itself as a Lighthouse to other authorities.

StreetCAV Plus, supported by the UK Government's Centre for Connected and Autonomous Vehicles (CCAV), deploys low-speed autonomous electric shuttles capable of carrying up to eight passengers. It incorporates a V2X communication framework, enabling real-time data exchange between vehicles, infrastructure, and urban sensors. This connectivity allows for coordinated movement, adaptive infrastructure, and seamless integration with broader Intelligent Traffic Systems.

Demand Responsive Transit and MK Connect

A core element of Milton Keynes' inclusive mobility strategy is its adoption of Demand Responsive Transit (DRT), with MK Connect serving as the flagship service. Launched in 2021, MK Connect enables passengers to book shared journeys via app, web, or phone, with routes optimised in real time based on user demand.

By 2024, MK Connect had facilitated over 500,000 annual trips or the equivalent to taking 65,000 car journeys off the roads each year, accounting for 6–7% of public transport use in the city. Early surveys indicate that 13% of users shifted from private car journeys. When fully integrated with UTC and SCOOT® 8, MK Connect will benefit from dynamic signal prioritisation—enhancing journey reliability and reducing overall delay.

MK Connect also forms part of the wider Mobility as a Service (MaaS) platform being developed in Milton Keynes. MaaS provides a framework to integrate services like MK Connect with other modes—such as fixed-route buses, rail, cycling, and e-scooters in a seamless, multimodal experience. Through a single interface, users can plan, book, and pay for complete end-to-end journeys, with real-time updates and personalised options based on network conditions. By embedding MK Connect into a MaaS ecosystem, Milton Keynes can offer more convenient, flexible, and connected alternatives to private car travel—supporting its wider sustainability and inclusion objectives. Critically, MK Connect serves areas abandoned by commercial bus routes, reconnecting isolated communities and reducing transport poverty for an estimated 12,000 households.

Active Travel and Pedestrian Integration

Milton Keynes also supports one of the UK's most extensive active travel networks—locally referred to as the Redway network. With 200 miles of traffic-free paths, if laid end-to-end, they'd stretch from Milton Keynes to Newcastle, forming one of Great Britain's most comprehensive active travel networks, the Redways connect key destinations and promote walking, cycling, and accessible mobility.

Investment continues through the Redway Super Routes programme, enhancing lighting, surfacing, and signage. TRL's development of Pedestrian SCOOT® further complements this by detecting real-time pedestrian demand and optimising signal timings to minimise wait times and improve safety. Integration of Pedestrian SCOOT® with the wider UTC system supports seamless travel across modes.

Challenges and Opportunities Ahead

Despite its progress, Milton Keynes faces challenges including a lack of national standards for V2X interoperability and the need for cultural change to encourage more sustainable travel choices. Addressing these barriers requires coordinated engagement, open technical architectures, and a user-centred approach to design.

There are also wider challenges for the wider traffic industry. Ensuring interoperability with third-party platforms, such as Demand Responsive Transit, MaaS applications, and CAV infrastructure, requires careful software design and adherence to evolving open standards. Scalability is another pressing concern—as the volume of live data increases.

Artificial intelligence adds its own demands: predictive models must be continuously validated, trusted by operators, and effectively integrated into live traffic management workflows. Additionally, there is a growing need to demonstrate return on investment through clear metrics—improvements in reliability, emissions, or modal shift—and to support the human users of the system through intuitive interfaces, training, and operational transparency.

Finally, safeguarding data privacy and maintaining compliance with data governance frameworks. These industry-wide challenges must be addressed in parallel to local implementation in order to build a robust, future-ready transport ecosystem.

However, these challenges are matched by considerable opportunities across the traffic management industry. The rise of AI, cloud computing, and edge analytics offers new tools for predicting congestion, optimising multimodal flows, and personalising travel services. All offering the opportunity for autonomation, increasing productivity of existing workforces and unlocking cost savings.

Growing demand for MaaS integration and real-time journey planning presents a chance for ITS suppliers to become core enablers of digital mobility platforms. Advances in sensor technology, connectivity, and automation creates new markets for enhanced data services, predictive maintenance, and adaptive control strategies. For forward-thinking companies like TRL, there is significant scope to co-develop scalable solutions with local authorities, deliver measurable environmental and social impact, and influence national transport standards through innovation leadership.

The Road Ahead: Scaling Innovation Nationwide

Milton Keynes proves that even the most car-dependent cities can transform. By treating transport as an interconnected ecosystem rather than competing modes, the city demonstrates that the future of mobility isn't about choosing between cars and alternatives—it's about making every journey intelligent, adaptive, and sustainable. As Milton Keynes approaches its 60th anniversary in 2027, it's not just updating its infrastructure; it's redefining what a British city can be with strong institutional partnerships and a commitment to innovation, Milton Keynes embraces the ethos of "where ideas become reality" to respond to the pressures of growth, helping to shape a smarter, more sustainable future for mobility.