Transport and Environment Committee

10.00am, Thursday, 17 August 2023

Response to motion by Councillor Bandel – Mobility Analysis

Executive/routine	Routine
Wards	All
Council Commitments	

1.   Recommendations

1.1   Transport and Environment Committee is asked to note this update on the capability of the Council's Smart Cities initiatives to improve mobility analysis across the city.

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THE CITY OF EDINBURGH COUNCIL

Report

Response to motion by Councillor Bandel – Mobility Analysis

2.   Executive Summary

2.1   This report responds to an adjusted motion by Councillor Bandel from Transport and Environment Committee on 8 December 2022 on mobility analysis.

3.   Background

3.1   On 8 December 2022, Transport and Environment Committee approved the following adjusted motion by Councillor Bandel:

3.1.1   To note that the City of Edinburgh Council's new upgraded CCTV system was able to collect a wide range of traffic and mobility data, including but not limited to numbers and movements of road and pavement users at particular junctions and locations.

3.1.2   To note that analysis of this data (e.g. traffic counts, analysis of pedestrian desire lines and modal analysis) had the potential to inform and improve the work of Transport and Environment Committee.

3.1.3   To request a report on the scope of opportunities that this system could present and to identify those transport strategies and action plans which could be improved using this evidence base within three cycles.

3.1.4   To request that the report consider the use of Artificial Intelligence to monitor traffic movements at key junctions.

4.   Main report

Smart Cities Overview

4.1   The Council has recently delivered three Smart City projects:

4.1.1   Intelligent Infrastructure;

4.1.2   Public Safety CCTV; and

4.1.3   Smart Waste.

4.2 To deliver these projects, the Council received a contribution from European Regional Development Funds (ERDF) of 40%.

Smart Cities and Public Safety CCTV

4.3 Within this project, the city's CCTV camera network has been upgraded. The previous system used traditional analogue technology whereas the new system utilises a modern digital system. The direct replacement of the city's PTZ (Pan-Tilt-Zoom) cameras was supplemented by the purchase of 100 static cameras, which are capable of capturing movement of people and vehicles within the built environment using Video Analytics software.

4.4 The Video Analytics software was procured alongside the CCTV upgrade. The software is capable of analysing the digital images from the static cameras to provide the city with more effective security and transport insights related to the movement of people and vehicles.

4.5 The system interrogates video images (in real time and retrospectively) so that numbers of vehicles, pedestrians and cyclists passing a particular location can be recorded. This provides the Council with the capability to monitor levels of active travel usage and the potential to prioritise active travel movements using the static cameras as an 'active travel detector'. It also provides classified traffic data relating to vehicles to assist in the creation of new signal timing plans.

Smart Cities and UTMC System

4.6 The Intelligent Infrastructure project focused on procuring of a new Urban Traffic Management and Control (UTMC) system. The UTMC system affects changes to signal timings at junctions which are connected and communicates with the Urban Traffic Control (UTC) system. This allows the Council to implement region wide changes to traffic signal timings to improve traffic flow, reduce congestion and improve air quality. These collections of planned signal timing changes at multiple junctions are called UTMC strategies.

4.7 UTMC strategies can be made active either by a pre-programmed mechanism using the in-built calendar, or by a responsive mechanism dependant on environmental conditions or traffic levels.

4.8 Major roadworks and events often impact traffic flow significantly. These can now be programmed into the UTMC calendar to enable signal timings to be adjusted accordingly.

4.9 In addition, the system is continuously monitoring environmental data from on street air quality sensors and car journey times across the city's road network. When journey times or levels of pollutants reach a pre-defined threshold limit, then the relevant UTMC strategy is implemented automatically. The UTMC strategy is then removed once conditions return to normal.

4.10 Journey time monitoring is provided across all major arterial roads in the city without any on street infrastructure, by sourcing data from a specific group of car manufacturers. This data is made available within the UTMC system.

4.11 Environmental monitoring is provided at 10 locations across the city by air quality sensors mounted on traffic signal poles. These measure the main traffic related pollutants Nitrogen Dioxide and Particulate Matter PM2.5 and PM10, as well as Ozone, Carbon Monoxide, air temperature and humidity. The air quality data is presented within the UTMC and influences signals' strategies which are pre-programmed to relieve any hot spots where air pollution hits undesirable levels.

UTC System

4.12 The Council's UTC system connects the UTMC system and the on-street signals, sending commands to traffic signal controllers to instruct changes between stages at junctions, making alternations to signal timing patterns remotely.

4.13 Alongside the pedestrian and cycle demand data from the Video Analytics system, the UTC will, in the future, allow signal timings to be optimised based on pedestrian and cycle demand, as well as using data from all classes of vehicles. This data will also enable bus priority to be provided on key public transport corridors in the city.

Supporting Delivery of the Council's Priorities

4.14 A summary of the benefits of the Smart City technology on delivering the Council's City Mobility and associated action plan priorities is provide in Appendix 1

5. Next Steps

5.1 This new Smart City technology enables the Council to more effectively monitor traffic and to adapt to real time information about active travel and pedestrian movements.

5.2 The data gathered will be used to:

5.2.1 Analyse new post-COVID travel patterns with a view to altering existing signal timing timetabled plans;

5.2.2 Assist with scheme planning and development (monitoring of new schemes such as Low Traffic Neighbourhoods;

5.2.3 Inform traffic modelling for roadworks timings;

5.2.4 Provide access to rich comprehensive traffic data;

5.2.5 Optimise signal timings across the network, to better prioritise pedestrians through lower cycle times achieved; and

5.2.6 Achieve cost savings for the Council as the information gathered will reduce the number of traffic surveys being commissioned.

Artificial Intelligence at Key Junctions

5.3 At this point, the information available through the Council's new Smart Cities initiatives is more reliable and future proofed than the potential information which could be gathered through Artificial Intelligence (AI).

5.4 However, there is interest in developing AI solutions using the Council's information (e.g. accident analysis) and officers will continue to monitor the potential of AI (particularly for site specific information) as its potential grows.

6.   Financial impact

6.1   There are no financial impacts arising from this report.

7.   Stakeholder/Community Impact

7.1   The benefits of these Smart City systems will be experienced by the citizens of Edinburgh in the form of reduced pollution and improved journey times.

7.2   The UTMC system will utilise data from a network of 10 air quality monitors to minimise air pollution hot spots, this should contribute to a positive impact on the health of Edinburgh's citizens and has the potential to reduce incidences of asthma and cardiovascular disease in areas where high levels of pollution are prevalent.

7.3   The Smart City systems provide the Council with the capability to improve travel times for specific modes of transport and incentivise walking, wheeling, cycling and use of Public Transport.

7.4   The UTMC system will reduce excessive delays for road traffic where large events or incidents are taking place which should deliver economic benefits for residents and businesses whose deliveries and travel times across the city will be more reliable.

8.   Background reading/external references

8.1   The report regarding the award of the contract providing the technology referred to in this report was considered by the Finance and Resources Committee on 26 January 2023.

9.   Appendices

9.1   Appendix 1 – Supporting the Delivery of the Council's Priorities.

Appendix 1 – Supporting Delivery of the Council's Priorities

Smart Cities and Action Plan delivery

City Mobility Plan

The Smart City systems installed will support Council initiatives such as the City Mobility Plan. The data collected will be used extensively for scheme evaluation purposes, as well as providing the capability to directly influence travel behaviour using the UTMC system.

PEOPLE 1 -Supporting behaviour change - Encourage changes in behaviour towards the use of sustainable modes of travel through information provision, initiatives and campaigns - The UTMC system collects granular journey time data on key routes across the city which can then be disseminated to the public via existing channels such as Edintravel. The breadth of data that the Smart City systems collect, combined with the flexibility to share data across a range of channels, provides the Council with the tools to influence behavioural change towards sustainable modes of transport.

MOVEMENT 27 - Harnessing New Technology Review and harness future technology innovations and digital connectivity including supporting the development of connected and autonomous vehicles - The Driver Information module available within the UTMC system is intended as a replacement for the decommissioned Variable Message Signs across the city. There are plans to deliver the V2X In-Car and Smartphone messaging as a future project within the contract.

MOVEMENT 28 - City Operations Centre Support the development of a city operations centre that will monitor, manage and predict movement and activity across the city - The Smart Cities initiative has delivered tools which allow the Council to better monitor, manage and predict human movement across the city whether this is in a car, on foot, wheeling or by public transport. The City Operations Centre is the hub for all of the Smart City projects, their inputs (data) and outputs are capable of influencing behavioural change and positively impacting the work towards Net Zero and climate change targets.

MOVEMENT 29 - Monitoring and Evaluation Ensure robust monitoring and evaluation of traffic and travel behaviour through regular and consistent data gathering - The UTMC system and Video Analytics system will ensure that the Council has sufficient data to monitor and evaluate any schemes which have been introduced as policy measures. The Smart Cities contracts have potential durations of 11 years, meaning that the Council will also be able to reduce expenditure on traffic surveys and be self-sufficient in traffic data over this time period.

MOVEMENT 30 - Managing Traffic Signals Manage traffic signal control to prioritise and balance safe and efficient movement of pedestrians, cyclists and public transport - The UTMC system allows the control of multiple sets of traffic signals simultaneously across the city, bringing the ability improve traffic flows without manual intervention. This brings the capability to significantly impact traffic flows in a positive way to target and incentivise specific modes of travel such as pedestrians, cyclists or public transport priority.

Active Travel Action Plan

The Active Travel Action Plan will be supported by the use of the new Smart City systems, through better data and evaluation, delivering cost savings and being able to provide cycle and pedestrian priority at traffic signals.

A number of actions in the Active Travel Action Plan will be facilitated and supported by the UTMC and Video Analytics technologies, improving the connectivity of our streets and neighbourhoods, making our streets enjoyable places to be and enhancing and expanding the cycle network.

A 'pedestrian priority' UTMC strategy has been constructed which defaults traffic signals to a low cycle time (lower waiting time for pedestrians) unless public transport journey times on key routes are significantly affected. The pedestrian and cycle data from the Video Analytics system together with the control functionality of the UTMC system provides a valuable tool in improving active travel within the city, as a better balance can be struck between the need to keep traffic moving and the need to reduce pedestrian waiting times.

The Video Analytics system will make it possible that pedestrian density on particular sections of footway within the city can be recorded and any physical changes to the footway, or management of pedestrian movement, can be based on data driven decisions.

The Video Analytics system has the capability to identify cyclists within a stream of mixed traffic. This has the potential be used to provide cycle priority and reduce wait times those travelling by bike.

Air Quality Action Plan

A network of 10 Air Quality sensors, measuring the main traffic related pollutants, Nitrogen Dioxide and Particulate Matter, will provide valuable data to inform the actions within the Air Quality Action Plan. The UTMC system is also capable of automatically responding (without human intervention) to high pollution events and implementing mitigation measures.

The Environmental monitoring network will assist in the delivery of the Air Quality Action Plan by providing a rich source of air quality data. The wider UTMC system and Video Analytics will provide valuable traffic data which can be used by organisations such as SEPA, who support the Council in their air quality modelling programme.

The UTMC project has strategically placed Air Quality sensors within and on the boundary of the Low Emission Zone (LEZ) zone in Edinburgh. This diurnal air quality data on traffic related pollutants will be of use evaluating the effectiveness of the LEZ and to ensure that no unwanted consequences arise.

Public Transport Action Plan

The Smart City systems will contribute to the delivery of the type of sustainable Demand Responsive Transport solutions identified within the Public Transport Action Plan. The link between the UTC system and an Automatic Vehicle Location (AVL) is currently being developed which will enable Bus Priority on key routes. The advancement of these

technologies and the data generated will provide opportunities to deliver a more efficient and sustainable transport system.

The integration of the Smart City systems with the bus priority AVL functionality provides an opportunity to significantly reduce bus delays at traffic signals, attracting more customers to this sustainable form of transport.