Thames Valley Live Lab – final review

As we pull the Thames Valley Live labs project to a close, where we have been working across the six Berkshire Unitary authorities, we have been reflecting on the success of the project which has brought air quality, energy, health, potholes together with transport to develop technologies and insights to improve services and our environment.

As I write, we have recently seen the latest update from the IPCC on climate change, and whilst the ADEPT Live Labs brief that we responded to was not focused specifically on carbon reduction, there have been a number of outcomes that give us insight into how we can decarbonise our services.

Building energy management may not, on the face of it, seem to be that relevant to a highways project, but it was a key workstream. Green energy is fundamental to the electric vehicle revolution. At present the electricity network in the UK is around 50% non-fossil fuel based, and with electric cars costing more in carbon to build than ICE cars, an EV is currently estimated to have around 80% of the lifecycle carbon footprint in the UK as a petrol car, although this can vary significantly by manufacturer. This carbon impact of EVs can be minimised if we charge them when the carbon intensity of the grid is at its lowest and a way of doing this is through integrating charging into building management systems, optimising energy demand across the building and charge points to minimise the impact of demand on fossil fuel generation.

The Thames Valley Live Lab has seen a number of assets being connected including building systems and local solar power to demonstrate the value of central energy management linked to live grid carbon intensity information. The key learning from this project, though, has been that the state of readiness for this type of system is nowhere near where it needs to be to deploy advanced management. This lack of readiness is in terms of the challenges to integrate to legacy systems, in terms of data ownership and lack of contract levers to enable integration in a number of cases, and in terms of the local authority structures where the stakeholders needed are not necessarily already working together and do not necessarily have the type of systems understanding that can aid implementation. The outcome of this project has been very valuable, opening up insights into what needs to be done and providing more basic energy information such as solar generation, which was not previously accessible. The project has led to the recognition of the importance of addressing these issues as a necessary step on the way to net zero and local climate emergency targets. This in turn is leading the councils to define the next steps to build on the learning from this project.

An extension to the energy project, we were able to extend the evaluation of Measurable smart sockets. These sockets use AI to monitor and control the various devices plugged in within a building. Results were strong with 30% reduction in small power usage at Reading's Bennet Road depot and we are looking to take this technology forward at scale.

The number of EV's on the road is growing rapidly but EV charging infrastructure for people who do not have off road space at home, and rapid charging infrastructure for those looking to invest in non-Tesla cars, is not seen as sufficient by many for the switch to EVs. As a part of the project, a study was undertaken across the 6 Berkshire authorities, with three reports produced at a Berkshire level and at individual authority level. The Local Authorities have the highest impact on public charging infrastructure and the Berkshire authorities need to meet an average yearly increase in EV milage of up to 50% to 2024. Berkshire needs to increase the number of chargers across work, home and public charging from around 5,000 in 2021 to 20,000 in 2024 which is a significant challenge. Most of these are expected to come from home charging, and the public sector needs to facilitate these

where people do not have off street parking. For directly delivered public charging, the number of charge points needs to increase from around 350 in 2021 to around 2,000 in 2024 although this could be higher or lower depending on the EV growth scenario. This highlights a significant challenge for the authorities, one which is very transferable nationwide as Berkshire is not particularly different to the UK average. The next stage for the authorities is how to meet this challenge, and specifically locate charge points reflecting local demand and the ability of the energy network to accommodate the charge points without excessive spend on reinforcing the energy infrastructure.

Enhancing network management also has a key role in reducing carbon as well as improving air quality. We have been able to implement and evaluate Roadcast, a network congestion predictive system, which uses a mix of historical data, current flows and machine learning to predict journey times in the short term and was able to effectively predict the effects of changes in flow due to COVID on journey times. Traditional traffic control systems are traffic responsive, whereas predictive systems enable network operators to be one step ahead, implementing traveller information and network management strategies to better smooth flow and improve reliability of bus journey times, particularly when there is an incident. We see significant potential here to better manage incidents and complement significant investment in bus-based mass rapid transit.

Staying with transport, the project delivered a number of smaller deliverables including updated open data interfaces that enable wider use of data generated by the traffic control systems and improved data collection. One example was the development of an IoT sensor that can classify traffic from existing traffic loops at a lower cost than that of installing a permanent count site. The level of classification is not the same as that of permanent sites but can be cost effectively delivered across a much wider area. For example, air quality monitoring can benefit from a much wider dataset across an urban area.

We are well aware that behaviour change is critical to meeting the interim carbon reduction goals to 2035 with ranges quoted of between 40% and 70% change in the way that we live, across all our carbon impacts. Transport is a key part of this, and Innovation Valley Rewards was launched across Berkshire and is based on rewarding sustainable travel choices. This research is ongoing to November 2022 and is providing a good insight into the challenges of encouraging real changes to behaviour.

Health has key links to transport and improving health is a driver for encouraging active travel. SpaceSyntax developed a health risk map for Berkshire drawing together a number of factors including travel behaviour and environmental and socio-economic factors. The study looked at Childhood obesity, adult obesity, and respiratory illness. The results were plotted on a risk map of Berkshire as a support to transport planners and environmental health officers. As well as showing the statistics in an easy-to-understand way, key findings were that Childhood obesity was more influenced by socio-economic factors than spatial factors, however, this was not the case with adult obesity where car ownership, public transport use and access to a range of employment and retail opportunities within 15 minutes was the key determinant. Where people travel sustainably either through necessity or through having those choices close at hand, they are less likely to be obese.

The project also looked at a number of aspects of air quality with the deployment by Yunex of 27 live EarthSense monitors across Reading, Wokingham and Thatcham with evaluation by the University of Reading and Stantec. The aims of the project were to evaluate the effectiveness of the sensors, evaluate strategies to improve air quality and to use the data to look for wider insights. The most detailed evaluation was undertaken in the centre of Thatcham where a number of sensors are located around the A4 and on adjacent roads and near a school. The findings were interesting in the

significant difference in air quality highlighted between the north and south side of A4 near the school, highlighting that people could significantly reduce exposure to poor air quality by simply crossing the road. The signal strategy was triggered on a 15-minute exceedance over a limit of 43.9µg/m3 and this triggered a change in the congestion importance factors to clear the main road in the peak periods. The effect of the interventions was a slight increase in NOx levels overall, but with the benefit of substantially reducing the level of exceedance in the peaks which would have the health impacts to people walking along the street at that time. With air quality strategies and understanding exposure to poor air quality, the devil is in the detail at a hyper-local level. An outcome of the project is the identification of a project for DEFRA funding that will look at funding maybe 6 to 10 solar powered, lamp column mountable, sensors that could be deployed around a school for 3 months and then moved on to another school. The data from these studies will enable very local strategies and information campaigns to be developed that overall reduce poor air quality and reduce exposure of people to poor air quality where it remains.

Alongside the sensor deployment were the development and evaluation of a 10m resolution air quality model for Thatcham that can provide air quality insights between the sensor locations which provided street by street level data that would be reasonable for informing travel choices. The sensors gave a number of insights to officers including the impacts of Reading Festival, highlighting the impact of the Railway on Reading post electrification and the generation of particulates, identifying congestion events near schools and monitoring construction dust impacts. In addition, indoor air quality adjacent to a main corridor was also investigated. For COVID, the results showed that the switch to more home heating was a likely cause for not seeing a linear relationship between traffic reduction and air quality.

Using AI and video recording of potholes was another area of investigation and cameras were mounted to 30 refuse vehicles across the authorities. The trial showed the potential for the technology to replace the annual condition surveys of more minor roads as a way of providing a consistent basis of comparison rather than comparing highway inspections from different officers who may view issues differently. In terms of identifying potholes to a level that was defendable, the trial did not sufficiently conclude that the technology was ready and more work would need to be done. The project faced two main challenges, firstly the amount of data collected from the refuse vehicle mounted cameras. As a trial they were not hard wired in and it was difficult to get the drivers to remember to turn them on which was exacerbated due to regular change in drivers due to HGV driver shortages. This meant that there was less data than was originally going to be collected. Secondly, each authority has different views on how they classify a pothole, and a one solution fits all approach does not work. Hence, the technology has the potential to learn each authority's approach, but would need significant further engagement to develop a tool that fully learns the way that they classify potholes and assess risk.

Being part of the ADEPT Live Labs programme has been an interesting project for us, and has led to a strong interest in the authority to push forward with innovative development. It has highlighted where we can better work together to meet future challenges and has generated a number of outputs that we are looking to take forward in some form.