SYSTRA

Roadmap to Decarbonisation:

Perspectives on Transport Policy and Innovation

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A DECARBONISATION POLICY PLAYBOOK TO SUPPORT LTP4 DEVELOPMENT

Achieving 'net zero' by 2050 is no easy task, particularly when many local authorities are struggling with limited resources. Yet the UK is legally bound to 2050 and with the Department of Transport (DfT) guidance on Quantifiable Carbon Reduction imminent, it is clear that decarbonisation must be at the heart of transport planning and every Local Transport Plan. So how can local authorities identify which proposed transport interventions will actually cut carbon and by how much? This is where the Decarbonisation Policy Playbook comes in.

By David Connolly

Decarbonisation Policy Playbook toolkit

The Decarbonisation Policy Playbook is a comprehensive toolkit commissioned by Midlands Connect and developed by SYSTRA in partnership with Atkins a member of the SNC-Lavalin Group. The toolkit can be used to explore the impact of different interventions and scenarios in reducing Greenhouse Gas (GHG) emissions, helping to create robust evidence-based and data-driven Local Transport Plans. The Playbook is designed to be used by Local Transport Authorities in England, transport policy officers and consultants working on their behalf.

Midlands Connect discovered a knowledge gap: how could local authorities identify the most effective transport interventions that would result in carbon reduction tailored specifically to their area? With the innovative Playbook tool, local authorities can now eliminate the guesswork (and stress), involved in appraising the likely carbon reduction impacts of measures which they may want to include in their local plans.

Quantifying Carbon Reduction (QCR)

The Decarbonisation Policy Playbook will help Local Transport Authorities follow the DfT's recommended approach to the Quantifying Carbon Reduction (QCR) component of the LTP4 process and support with the development of the all-important 'net zero' challenge. The Playbook can be considered as a really useful ready reckoner to enable LTAs identify, at a strategic level, the schemes and policies that can be included in their Net Zero strategy. Schemes can then be designed and appraised in detail to make sure that the right interventions will achieve the planned outcomes.

Sustainable modes – walking, cycling and public transport

We know that improvements to make sustainable modes - walking, cycling and public transport – more attractive can generate significant increases in the use of these modes, but it is often difficult to find evidence to quantify the corresponding reduction in car kms and any associated reduction in Greenhouse Gas (GHG) emissions. The appraisal of measures including the reallocation of road space from car traffic to sustainable modes needs particular care in order to capture the trade-off between the reduced car kms and any higher emissions per km from traffic that remains. The Decarbonisation Playbook captures these complexities and many other scenarios, so it can help inform initial strategic decisions on what to include or exclude from an LTP.

So how does the Playbook work?

Designed for ease of use, the 'User Interface' allows users to select interventions and add them to a scenario for analysis. Users can test single interventions or packages of interventions for maximum flexibility. For example, the initial plan might include improvements to walking and cycling networks, improved bus priority, increased parking charges and the introduction of a Workplace Parking Levy in relevant urban centres. The Playbook can be used to answer questions over time such as: will the addition of certain measures reduce the GHG emission rate? The Playbook does the hard graft for its users, behind the scenes, the 'Calculation Engine' crunches the numbers and applies the impact of the chosen interventions to vehicle kilometres. Finally, the 'Emissions Module' uses the revised future fleet profile proportions to calculate carbon emissions in each future year and generates charts and tables which clearly summarise the predicted carbon reductions over time.

The Playbook is calibrated to predict how geography will affect the predicted impacts of different interventions, with seven place types, ranging from city centres which have constrained parking and higher mode share of public transport and active modes to remote rural areas which have longer-than-average trip lengths and where the alternatives to car use for all but the shortest journeys are limited.

The Playbook uses the local or regional authority's distribution of place types (based on ONS boundary data or MSOA) to allocate traffic emissions and apply the impacts relevant to each place type. There are typically much lower impacts in rural areas and small towns than in city centres and suburban areas. The Playbook then then fits the jigsaw pieces together to provide an estimate of the change in a local authority's overall traffic emissions.

The benefits don't stop there

The Playbook generates informative outputs, including graphs providing an emissions forecast with the new strategy in place. Users then have the evidence they need to track progress and make informed decisions in accordance with the DfT's QCR guidance.

The Playbook is built upon a robust evidence base. It combines case study data from 122 sources selected from a comprehensive 'Rapid Evidence Assessment' scoring system with analysis of the mode split patterns of around 1.5 million1 individual trips recorded by the English National Travel Survey 2012 and 2019.

The drive to achieve net-zero emissions by 2050 is a crucial step in our battle against climate change, yet the timeframe is relatively short considering the magnitude of the behaviour change required. This powerful evidence-based tool will help manage expectations regarding what can be delivered through a package of 'carrot-only' measures and if indeed big 'sticks' are required.

With the Decarbonisation Policy Playbook, local transport authorities can plan with confidence and be assured that their estimates of carbon reductions are based on a standardised evidence-base and DfT-approved approach.

If you require assistance with any aspect of your LTP4 preparation including the Quantified Carbon Reduction process, please contact David Connolly at SYSTRA dconnolly@systra.com

SUSTAINABLE CONGESTION CHARGING – A BETTER WAY – A BETTER FUTURE

Are you an authority that needs to reduce traffic while providing better transport services but are thwarted by budgets that are impossible to balance? If you are, then read on, SYSTRA has a radical and innovative solution that might help you achieve your goals.

A chance encounter with a city authority led me to re-think the current approach to congestion charging. The city authority indicated a need to limit traffic while producing revenue that could then be used to further enhance liveable spaces which would also promote active, shared and public transport. A noble cause and in my view something that we should all be striving to achieve.

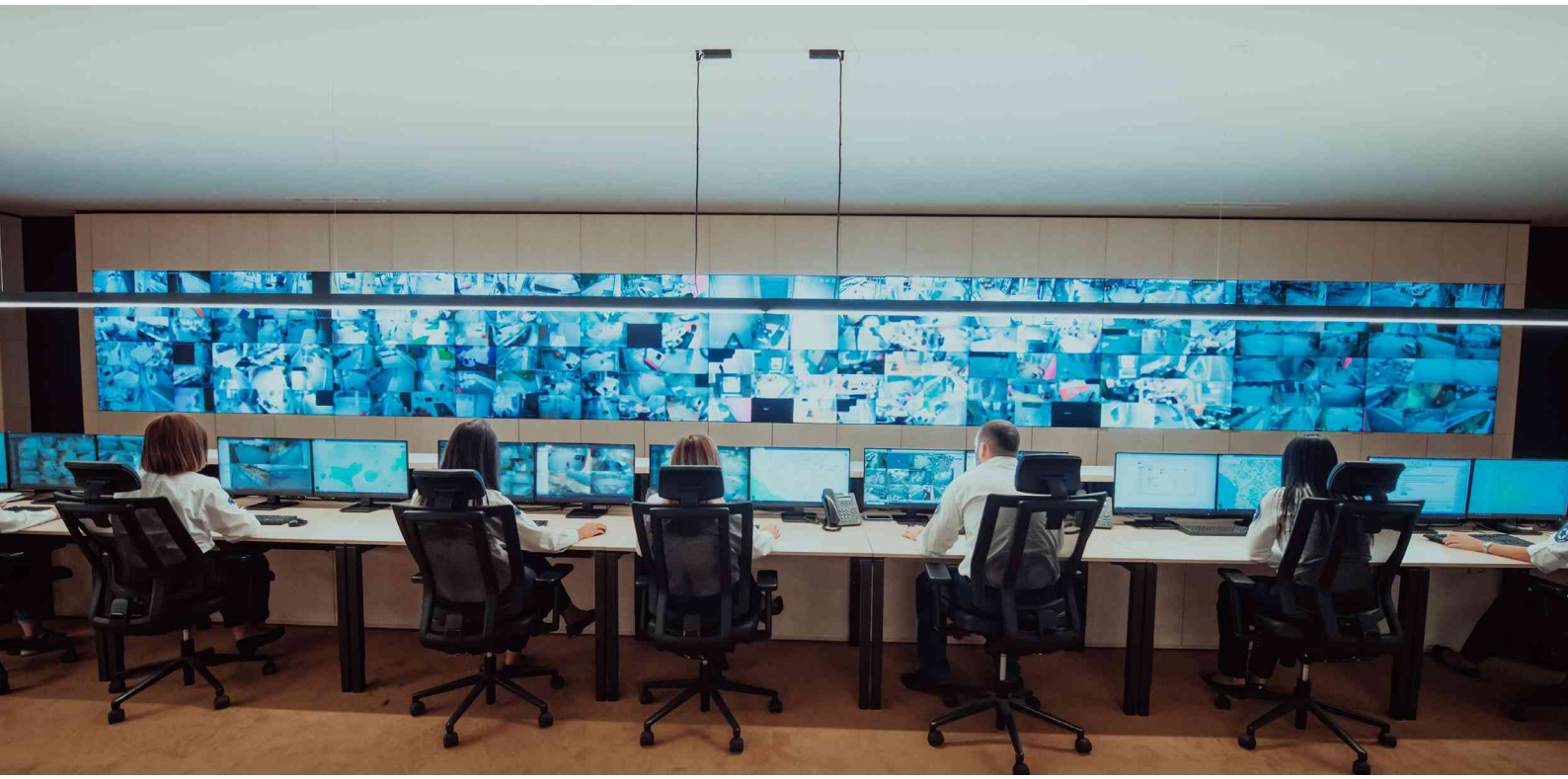
By Jorgen Pedersen
Director of New Technology, SYSTRA

Being absolutely honest, I was slow to fully comprehend the impact of global warming. My previous roles required me to spend huge chunks of my time travelling around the world to attend to a wide array of customers. So, I am no role model. But times have changed, there is no denying the need to reduce our carbon footprint, and no denying that we all have to play our part for the sake or not only our own health but the well being of future generations to come. There is no denying that climate change is already affecting our everyday lives, no denying its already having a devastating impact on nature, and even now it's very likely that we are addressing this too late to protect a multitude of animals, plants and insects. All this to say, that we need to be much more proactive in our aims of reducing our reliance on the private car, while moving towards our agenda for more active and healthy lifestyles.

There are many reasons why an authority may want to consider some form of congestion charging including traffic reduction, promoting healthier and more active communities, decarbonisation and/or pollution reduction, and not least revenue generation to support infrastructure projects that will further support all of the above reasons. So, it was with interest that I was listening to the aspirations of this city authority, and their plans for congestion charging to significantly reduce their inner-city traffic issues. They had already undertaken some design and development studies but had been forced to conclude that congestion charging for them was cost prohibitive!

That didn't seem to make any sense to me, but they went on to explain why that was. The cost of designing and implementing a cordon of cameras, communication infrastructure, the maintenance of said infrastructure, the back-office, enforcement, would just about break even at current traffic levels. However, when expecting a reduction in traffic of anything from 15-20% the sums just didn't equate. The big take away from this is conversation was that the infrastructure and ongoing maintenance was simply cost-prohibitive for all but the largest of cities.

This got me thinking about whether there was a better way of doing this, which wasn't cost prohibitive but could still provide the benefits of traffic reduction while securing the much-needed revenue to accommodate social improvements. The foundation of my thoughts centred around the need to minimise opex costs which in turn would maximize revenue that could then be used for community development schemes such as cycle paths, pedestrianizing areas, mobility hubs etc. This is what we came up with: One of the limitations of the traditional congestion charging scheme is that once inside the congestion area, one can pretty much travel as much as one wants because one is not transitioning across the zonal camera cordon. To overcome this, roving camera platforms have been introduced, which are essentially cameras that are mounted in vehicles which can travel around a congestion charge area and park up and take images of any vehicle that they take which shows a number plate. The more roving cameras that there are the higher the proportion of inner-zonal travellers that are captured and charged.



Extrapolating this a little, my thoughts were, would it be possible for a city to be solely reliant on roving camera platforms, and if so, what would be the impact of such an approach? After much thought, much discussion a period of design and a period of just trying to pick holes in the general concepts being introduced we had to conclude that not only would this provide a relatively infrastructure-less solution but that the approach offered a number of advantages that cannot be achieved through the traditional high-cost congestion charging approach. Let me explain. Camera technology has also increased exponentially since 2002 when cameras were first used for the London CC zone. They now are able to communicate in real time using cellular networks, back in 2002 we'd never heard of 3G, 4G and certainly not 5G, smart phones had yet to make an appearance, but were being discussed. ANPR software was also in its infancy, and the idea of using ANPR (Automatic Number Plate Recognition) on a rolling shuttered 1CCD/CMOS sensor would have been a complete impossibility due to processing constraints. All of that has changed. I personally worked with a very small team who developed a low cost ANPR smart camera using a rolling shutter and tested it up to theoretical 120MPH at an oblique angle, without ANPR misreads. Cameras have gotten smaller, their frame rates have increased, rolling shutters which are significantly cheaper than global shutter sensors have improved, communications are staggeringly reliable and fast and ANPR software is now cheaper and continues to improve, while at the same time the price point for cameras continues to fall.

So, what if we only use roving cameras, we mount inexpensive cameras on a fleet of cars that are multi-purposed such as, local authority vehicles, police cars, buses, etc. all of which can capture number plate details. This is sent back to a back-office where ANPR is captured, and where revenue and enforcements are managed.

How can I only monitor vehicles whilst within the Congestion Charge Zone?

The naysayers amongst us will instantly start picking holes in this and suggest that we will need to in some way limit the recording of vehicles outside the congestion charge zone, or how can we make sure that we capture everyone, or how can we introduce flexibility to enable free travel on Sundays etc., and does it provide sufficient flexibility to expand the area in the future? Some will even suggest that Low Traffic Neighbourhoods (LTN) are not publicly or politically supported, and its fair to say that LTN's have become a political battleground, which I believe will be seen as being a collective failure by our politicians, who might do better to focus on our legally binding carbon reduction promises. But all of these comments and questions will be answered: How can I only monitor vehicles whilst within the Congestion Charge Zone? I believe we all have a right to privacy, and that must be protected, however I also believe that we all have a right to clean air, and healthy living, and that should also be protected. So, whilst it is essential to monitor license plates within the congestion charge zone we could set-up a geofence enabling the camera only to operate while within the zone. As soon as the camera passes the geofence boundary the camera would be turned off. This would provide the opportunity to provide ANPR results from within the zone itself but not outside of that zone. There is also a suggestion that a cordon of cameras is actually more privacy invasive as it records every vehicle's movements across the boundary.

Does it need to capture everyone?

One of the many benefits of this is that one does not need to capture everyone. One would set-it up as an honesty-based solution. If you knew you had been in the area it is your responsibility to make your payment. Failure to do so would invite a hefty enforcement fee on being caught. As per the London CC fee structure the hefty enforcement fee provides an incentive to ensure that congestion charge fees are paid promptly.

For those cities that wished to provide an account-based management system this could be achieved through the use of a dedicated mobile app, which would instantly alert the back-office system when a vehicle had transitioned the zone. At this time funds could immediately be removed from the holder's account. If the driver had decided to turn off their app, then the same process would apply, if spotted by a roving ANPR camera, the camera would send details back to the back-office, a driver would have a time limit on when they should pay, and if they did not pay then they would get an enforcement notice.

But based on this being an honesty system, the system is not expected to capture everyone, just provide sufficient incentive to drivers to pay promptly voluntarily.

Can this introduce sufficient flexibility to meet the changing needs of a city?

One of the main advantages of this system is that it works through an interconnected communications network, and is software based. This means that we could essentially set up any number of business cases (scenarios) that could all be accommodated, such as:

- Morning and evening charge times could vary by day of week
- Weekends could be free, or charged, or could incur partial charges
- Poor air quality days could introduce additional charges
- Zones areas could be changed to accommodate events – either making them bigger or smaller. Although this would require additional signage, and additional geofenced areas
- If introducing the dedicate mobile app mentioned, this could also be charged for vehicle miles travelled whilst within the congestion charge zone. In the event that the mobile app were turned off a maximum daily charge would apply
- One could charge different classes of vehicles different fees based on a link with DVLA to identify the vehicle type
- Residents within the congestion charge zone could get reduced rates by way of a permit list
- Doctors, emergency services, and special categories could also be given reduced rates or free travel based on a permit list

Long and short-term changing needs

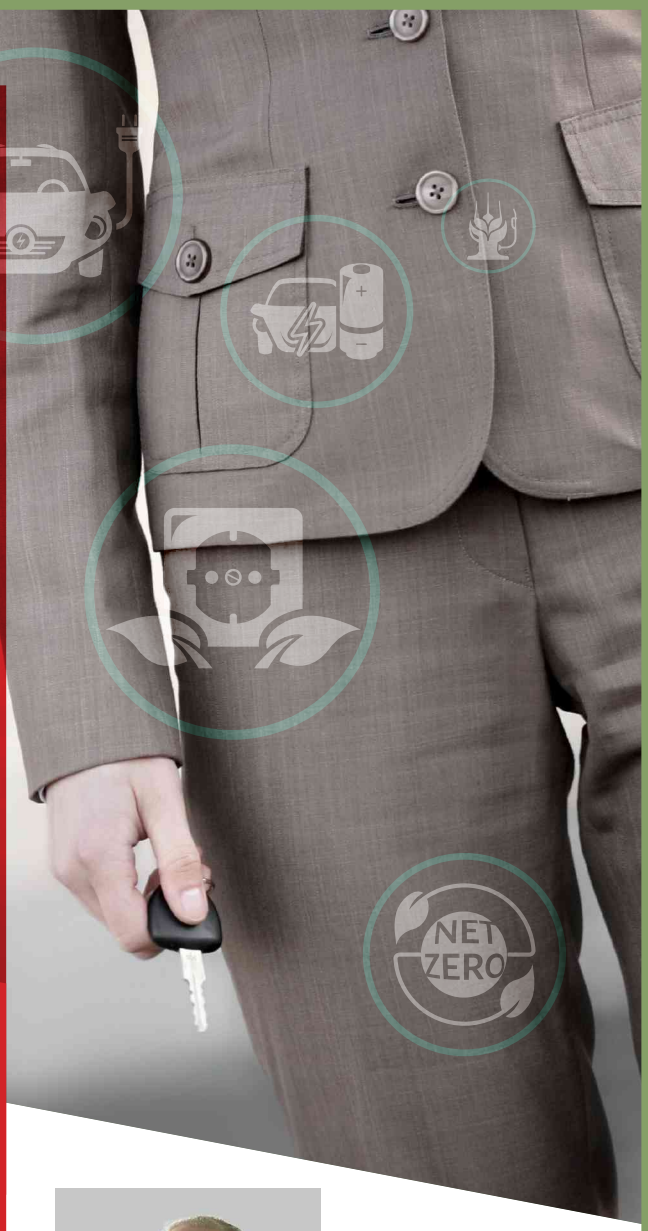
Due to being software-based, with a configuration layer it is possible to develop a solution that not only meets the current needs of the city, but that can also adapt to the longer-term changing needs and requirements of the city as well as the short-term amendments that would perhaps be introduced during rail strikes, emergency situations, or even special events. It would and should be possible to have these special events set-up as scenarios, which could be scheduled or instigated as needed.

Public and political acceptance

Inevitably, change forces us to do something differently, changes one's perceptions of the world around us, challenges us to pursue other options and can consequently impact our daily norms. In is inevitable therefore that we actively fight again forms of change that we believe will change our daily lives. The interesting thing is that once we have transitioned, that becomes our new norm, which we more often than not embrace equally as actively as the previous norm. It's therefore no surprise that during public consultations the concepts of LTN (Low Traffic Neighbourhoods) are heavily critiqued and many have been cancelled as a result of public and political backlash against such schemes. However, lets look back a little, and look at London, do we remember how congested London was, and how pleasant it now is? The same can be said for other more mature schemes both nationally and internationally. If we are even moderately concerned about reducing pollution or having the ability to make changes for healthier lifestyles, we must look to reduce our over reliance on single occupancy vehicles. This will take a consolidated behavioural change campaign that could be supported by an organisation that specialises in Social Market Research and engagement.

This is just a high-level conceptual design the detailed design phase will certainly unearth a number of other issues which will also need to be overcome. But this approach does provide an opportunity to deliver congestion charging zones to smaller and less affluent cities at a fraction of the cost that a traditional congestion charge solution. If you are a small to medium sized city and are interested in moving forward your congestion charge or FMZ agendas, please feel free to contact me if you would like to discuss this approach in more detail.

ROAD USER CHARGING – IS THE TECHNOLOGY THERE YET?



Thinking around road user charging, distance-based payments, and even mileage rationing is ever widening with new concepts and suggestions being aired and brought forward every other week. Jorgen Petersen explains there are already many solutions in place throughout the world which promote modal shift, reduce traffic, and improve air quality.

By Jorgen Pedersen
Director of New Technology, SYSTRA

So why discuss alternative ways of Road User Charging (RUC)?

Is it to decarbonise? Is it to try to use the current infrastructure more efficiently? Is it to be more ecologically aware? To promote behavioural change? To provide a safer infrastructure to manage the Strategic Road Network (SRN) and the Major Road Network (MRN)? Is it simply to generate revenue? Perhaps we want to be fairer and more equitable, particularly as more Battery-powered Electric Vehicles (BEV) are using our roads that don't currently pay road tax nor fuel duty? To me, it must be a combination of all of the above.

The government thinks the public are against such schemes. But when asked, public perception is that change is necessary, and that the government is being too slow to implement some of these measures for political reasons.

This article aims to address three core questions:

1. Are the road user charging schemes that are being promoted equitable and fair?
2. Why should road user charging replace the current fuel and road tax duty?
3. Does the technology exist to provide a fairer and more equitable approach to charging for road use?

With the exception of the pandemic years, traffic and congestion on our road network, has continued to rise year-on-year since the end of WWII. The cost of road infrastructure and its maintenance has also been steadily increasing. There is now an understanding, a realisation, and growing acceptance that it would be virtually impossible to build sufficient infrastructure to continue to meet future demand. This requires a deep dive into the perceptions and requirements placed on our road network and how their use can be better managed.

> 13% of vehicles account for around 54% of all vehicle miles travelled

For decades, fuel duty and vehicle licence duty have been the two main mechanisms to charge for car use and ownership respectively. Why change? Surely the current vehicle taxes and fuel duty is sufficient, equitable and fair? Well, not really. After scouring many official and government reports I was able to deduce that around 13% of vehicles account for about 54% of all vehicle miles travelled. This figure may not be absolutely accurate, but it does indicate that a small proportion of us account for the greatest amount of wear and tear on our nation's roads. We must also consider that zero emission vehicles currently do not pay vehicle tax nor fuel duty and weigh on average about 30% heavier than their internal combustion engine siblings. For EVs, we need to consider the carbon required to generate the electricity to power them, and the additional tyre and brake particulates that heavier EVs emit, which are now believed to be equally as damaging to our environment. In parallel, more efficient engines has meant less duty paid for more vehicle miles travelled, leaving successive Chancellor's out of pocket.

If the current vehicle tax and fuel duty system isn't fair and equitable, what is? The main contenders are:

Tolling Systems

Road tolls are not new and have been in place in the UK since the 17th century, where parishes set-up levies on road users to pay for road and bridge administration and maintenance. Over the years this has developed into Electronic Road Tolling (ERT) systems requiring electronic payments, where a vehicle is no longer required to stop. While this could be deemed equitable and fair, depending on your perspective, it doesn't take emissions into account. It can also lead to additional vehicle miles travelled when drivers take more circuitous routes to avoid the toll charge. It also only provides funding for that specific piece of road, not necessarily the rest of the road network.

These systems are common around the world, but do require gantries, cameras, Radio Frequency Identification Readers (RFID), and Automatic Number Plate Recognition (ANPR) software to collect vehicle and driver information to charge the driver from a pre-existing account. All of which are expensive to implement, manage and maintain.

Distance Based Payment Systems

While electronic road tolling systems can be distance based, and charge a variable price based on where one gets on and off the road network, they still only charge for a specific segment of a road, and in some cases can be avoided by those electing to take a more circuitous route. In New Zealand for example, drivers are charged based on the vehicle they are driving for every 1000km travelled verified at the time of their annual MOT (or equivalent).

Even trailers incur a charge depending on the number of axles and maximum permitted weight. The cost for your 1000km is also heavily dependent on where you live and your reliance upon a car. For example, in London with its fully integrated public transport network and with little reason to own a car, should a person be expected to pay the same as someone living in rural Scotland where the private car is the only option to travel to work, get groceries, take the children to school or even visit the not-so-local GP? That said, this does seem at first to be a fairer and equitable approach which is easy to understand and implement.

Threshold Payment Systems or Congestion Charging

The first congestion charging scheme was implemented in Singapore in 1994, then Durham in 2002, closely followed by the far greater and much more involved London Congestion Charging Scheme which went live in February 2003. Since then, we have introduced Workplace Parking Levies (WPL), clean air zones, ultra clean air zones, all of which use the same basic technologies to reduce traffic along a specific corridor or region.

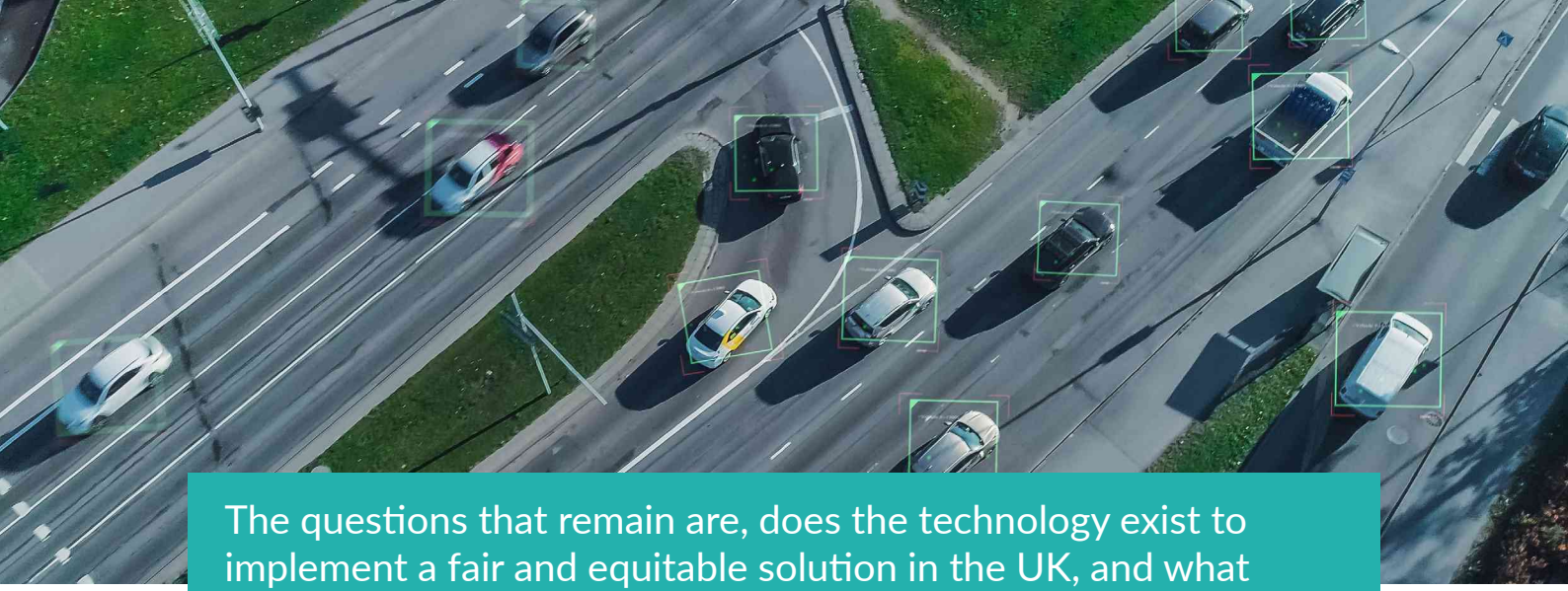
The most evolved congestion charging scheme is in Singapore, charges are variable based on the time of day, levels of congestion and vehicle type. Yet I would ask – is it really fair? For example, to charge one person the same amount to drive 1 mile into London as someone else who enters in the morning, drives all day, clocks-up 172 miles and then departs at night. Probably not.

At this point we must clarify the distinction between localised threshold payment systems such as localised congestion charging, Low Emission Zone (LEZ), Ultra Low Emission Zone (ULEZ), (Workplace Parking Levy (WPL), and the general use of the SRN, the MRN and the local road network.

While threshold payment solutions have been in existence for decades, the threshold is based around the introduction of a cordon of cameras to identify when a vehicle crosses a threshold. As the threshold size increases, more and more vehicles could potentially travel within the zone without going through a camera check and therefore without being captured. This is overcome by introducing roving camera platforms within the zone to capture vehicles that haven't crossed any part of the camera cordon, but which still need to pay for the privilege of driving within the zone. As the region increases in size, it either requires additional camera cordoned zones or an exponential increase in roving camera platforms, both of which are expensive, and neither of which provide long-term viability. So, the challenge is how to develop a system that can be expanded to incorporate a country-wide deployment which is equitable, fair, maintainable, and affordable.

What should a national road user charging scheme address?

The best example is in New Zealand, it is simple to implement, doesn't necessarily need a great deal of technology and takes into account the area where a person lives as well as the vehicle type. But what the New Zealand model doesn't seem to take into account are the availability of modal alternatives for the journey, the roads that are being used by the driver, the time of day of the trip, or air quality. If we want to be more environmentally conscious and equitable, we need to provide a mechanism for variable priced models that can take account of availability of modal alternatives, traffic requirements, congestion, air quality, and an easily understood pricing model which can gradually start to change travel habits and trends of non-urgent vehicle use. But, variable pricing does become exponentially more complex, and more difficult to understand.



The questions that remain are, does the technology exist to implement a fair and equitable solution in the UK, and what would such a system look like if we were to start to plan for it?

Through a vehicle tracking technology, which is simple to implement, identifying which roads a particular vehicle was using, is for some, conceived as an invasion of privacy particularly, if the date and time are captured. But in reality, is this so different from how open loop payments are undertaken on public transport? Doesn't TfL get the same information about a customer's movements when they use the tap-on tap-off system in London. TfL already have the ability to identify that a person entered the gate at a particular station and exited at another. The difference is that this information would be specific to a vehicle, person or account. However, it isn't dissimilar to the data we regularly provide to insurance companies or even provide each time we use mapping apps.

In my view the best approach would be to start simple through implementing something similar to the New Zealand charging model. This would be based on a yearly declaration of milage or odometer check and the car owner's access to alternative modes of transport at the location the vehicle resides. We can then gradually introduce variable pricing options to improve the equitability and environmental credentials of the scheme as public perception improves. Variable priced options could then apply to the SRN, MRN and even when entering or leaving a large city such as London, Birmingham and Manchester. At the same time a change management campaign can be undertaken to help explain why it is necessary.

The charging model could later be expanded to accommodate variable priced options, that could be integrated with air quality monitors, reduced speeds and at the same time charging more based on poor air quality, this would need to be integrated with existing ANPR technologies or ERT transponder-based technologies to indicate variable speed thresholds and which vehicles have entered into those zones.

Tracking the number of miles undertaken and the routes used, would require some form of road use tracing. An option could be a variable priced approach, tracked via a GPS enabled in-vehicle app which is already used by the driver. The app would carefully and accurately log the number of miles driven on the SRN, MRN or local threshold charging model, and be charged for actual vehicle miles travelled. If drivers don't wish to sign up to this GPS approach, an alternative could be for drivers to pay a fixed fee per day, set according to vehicle type.

There are options available, fairer and some more equitable than others. Variable priced solutions will require more infrastructure and the ability to identify where the vehicle is travelling to and from. My recommendation is that the current fuel duty and tax system is neither fair nor equitable and does not provide effective incentives for ecological and environmentally sustainable travel, even after conventional road fund licence is applied to BEVs in 2025.

To promote the wellbeing of our planet it is essential that we start simple and then implement variable priced options as and when it is sensible to do so, this approach requires very little additional infrastructure and builds upon a tried and tested approach.

Are we being overly cautious in our approach to trying to reduce vehicle miles travelled with an intent of reducing traffic and congestion while improving air quality? I would like to invite you to get in touch and offer your perspective.

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