

# Connected Places Catapult

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## Assessing Sustainable Transport Solutions (AsSeTS) for Rural Mobility

Rural Mobility needs across communities in the UK



July 2020

**CATAPULT**  
Connected Places

## Executive Summary

**The CPC Assessing Sustainable Transport Solutions (AsSeTS) for Rural Mobility project, funded by Department for Transport under the DfT-CPC Collaborative Programme, will identify ways to improve accessibility and transport solutions in rural environments by improving the knowledge base around demand for new mobility services, using a data-driven approach.**

In doing so, the project will identify and suggest ways to remove barriers which prevent New Mobility Services (NMS) being commercially viable in rural areas by:

- Using data-driven approaches to understand typical daily travel patterns; and
- Identifying new mobility services which can be deployed commercially, and those that will be likely to require on-going financial support, in order to provide socially necessary services.

This report provides insights of a workshop organised by CPC on the 18th June 2020, designed to collect thoughts from stakeholders actively involved in solving problems related to rural accessibility/ mobility/ isolation/ technologies and platforms that could be adapted to a rural context.

The workshop focused on the needs of rural communities across England and the wider UK, their perceived barriers to the uptake of on-demand mobility services and their vision for an ideal on-demand service in rural areas.

Participants highlighted the existence of different definitions of rural areas across the country, which are then combined with different users' needs and travel behaviours. It was noted that mobility services tailored around the rural user will require a connection with local users to personalise services. This implies a lot of prior work (e.g. effort, time and money) to test viability and make it attractive for use.

Based on knowledge from previous projects conducted by CPC, the data-driven approach which uses mobile network data is considered very useful to reveal current travel patterns and testing alternatives.

During the workshop the main perceived barriers to the uptake of on-demand mobility services were identified as:

- Lack of suitable public transport services;
- Lack of Integration as a crucial point in the provision of mobility; and
- Lack of reliability at interchanges and of flexibility in providing suitable alternatives.

The rise of Digital Demand Responsive Transit (DDRT) has made this flexible service rapidly available to urban areas, but many rural areas are facing digital poverty and technological barriers in booking trips of this type.

During the workshop, the idea of mobility hubs as an access point to mobility and services was mentioned as a possible solution. However, funding available is too short-term to sustain the creation or transformation of mobility hubs and there will be not enough revenue (initially) to operate without creating a burden on tight Local Authorities' budget.

A new generation of mobility hubs should create the support required to access a wide range of new mobility services (e.g. car clubs, active travel solutions such as e-scooters and bike-sharing) to allow rural users to tailor transport choices to their needs.

Real-time, app-based bookings are considered important: however, in rural areas these are limited by the poor connectivity and signal coverage, whilst phone booking seems more suitable for older generations. Similarly, logistics should be also included, so that moving people and goods will establish and validate new business models.



Although the workshop was not designed to consider the transformations and impact on travel habits during the COVID-19 lockdown and the transition towards a “new normal”, participants talked about the conditions and limitations experienced in rural areas. It was felt that the lockdown acted also as a catalyst to boost digital connectivity and use technologies to ease isolation and pay for services, either by phone, web or mobile apps. The shift was rapid, and people drastically changed their behaviours, being more open to new ways of fulfilling their needs.

People felt that the lockdown provided the opportunity to innovate and create a transition towards a healthier lifestyle with the discovery for high quality and local produce and a renewed appetite for active travel in communities with high car ownership. However, there is a risk that rural areas will revert to pre-lockdown travel behaviours as restrictions are lifted. Hence it is imperative to implement initiatives designed to support changes in travel patterns and introduce innovations in the way rural citizens travel.

In conclusion, a holistic approach is required to look at rural mobility beyond the administrative boundaries, where data-driven solutions look at residents' door-to-door travel patterns and support a full integration with more traditional scheduled public transport.

Given the dispersed nature of the sparse settings, rural users need to have a single point of reference, such as a mobility hub, to confidently access a new range of flexible, on-demand services and get used to the digital technologies that support a seamless integration of mobility services for people (e-bikes, e-scooters, DDRT, car clubs) and goods (lockers and consolidation centres for door-to-door deliveries).

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## Notice

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This document has 24 pages including the cover.

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# 1 Introduction

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## 1.1 Background

The CPC Assessing Sustainable Transport Solutions (AsSeTS) for Rural Mobility project is funded by Department for Transport under the DfT-CPC Collaborative Programme and is being delivered between April 2020 and March 2021.

The project is identifying ways to improve accessibility and transport solutions in rural environments by improving the knowledge base around demand for new mobility services, using a data-driven approach.

In doing so, the project will identify and suggest ways to remove barriers which prevent New Mobility Services (NMS) being commercially viable in rural areas by:

- Using data-driven approaches to understand typical daily travel patterns; and
- Identifying new mobility services which can be deployed commercially, and those that will be likely to require on-going financial support, in order to provide socially necessary services.

CPC has identified in previous studies (Business Case for NMS: demand modelling tools, 2019) that legacy datasets are available in all rural areas, but they are often outdated and do not reflect current travel patterns of users.

In order to be able to deploy flexible and on-demand mobility services, the new and existing mobility operators need to be able to design services which are fit for purpose and need to have access to this information.



## 1.2 Scope of the workshop

A workshop was organised on 18th June 2020, to collect thoughts from stakeholders actively involved in solving problems related to rural accessibility/ mobility/ isolation/ technologies and platforms that could be adapted to a rural context (the workshop agenda is shown in **Appendix A**).

Due to the restrictions in travelling in response of the COVID-19 pandemic, the workshop was organised on-line and 41 participants from 14 areas across the UK joined the debate (including areas such as Buckinghamshire, Cumbria, Essex, Hertfordshire, Leeds, London, Manchester, Northamptonshire, Northumberland, Peak District, Somerset, and participants joining from Scotland and Wales). Break-out rooms with 8/9 participants and chaired by CPC project team members were organised following a plenary session, to allow participants to engage in the debate more actively. See **Appendix B** for a list of participants.

Participants were from a wide range of backgrounds, including academia, local or transport authorities and industry actively deploying trials for New Mobility services or technologies in support of these trials. Moreover, the debate concentrated on the importance of data and how data is currently used in supporting the launch and delivery of these services.

The workshop focused on the needs of communities across England and the wider UK to understand:

- Needs of the rural users and perceived barriers to the uptake of on-demand mobility services;
- What the ideal on-demand service looks like in rural areas in order to serve the residents, including the needs of those that are commuting into nearby urban areas to reach jobs and services.

Two case studies were presented on Northumberland and County Durham to show how new data sources, such as Mobile Network data, perform in rural areas. The data analysis was developed using the tools created for the DeMAND project (CPC, 2020) and analysing travel patterns from the digital twin created for the North East of England. Mobile Network data can reveal the catchment area of the service when aggregated at activity-chains level. The data analysis also highlighted the daily activity patterns from residents and commuters and from freight movements.

Further details on the case studies will be summarised in the report "*Data Landscape for rural Communities*" which will be released in Autumn 2020.

## 1.3 Structure of the report

This report summarises the findings from the workshop and the discussion that participants had during the day. It is divided in four main sections which cover the main topics discussed in the workshop:

- **Section 2:** Needs and barriers to the uptake of new mobility services in rural areas;
- **Section 3:** The ideal service;
- **Section 4:** A data-driven approach to support new mobility services;
- **Section 5:** Impact of COVID-19 lockdown in rural areas.

In Sections 6 and 7 conclusions are drawn and next steps for the project identified.

## 2 Needs and barriers in rural areas

### 2.1 Defining rural

Participants were referred to different definitions of rural areas across the country, which are then combined with different users' needs and travel behaviours.

CPC has adopted the Office for National Statistics Rural Urban Classification, developed by DEFRA (2017), based on populations and settlement type (density profile of dwellings in each 100m × 100m square in the country).

The Classification defines areas as "Rural" if they fall outside settlements with more than 10,000 resident population. Rural areas are then classified into six categories, depending on whether they are in a sparse setting (three categories) or a not sparse (three categories), and aggregated in "Town and fringe", "Villages" and "Hamlets and isolated dwellings" (Figure 2.1).

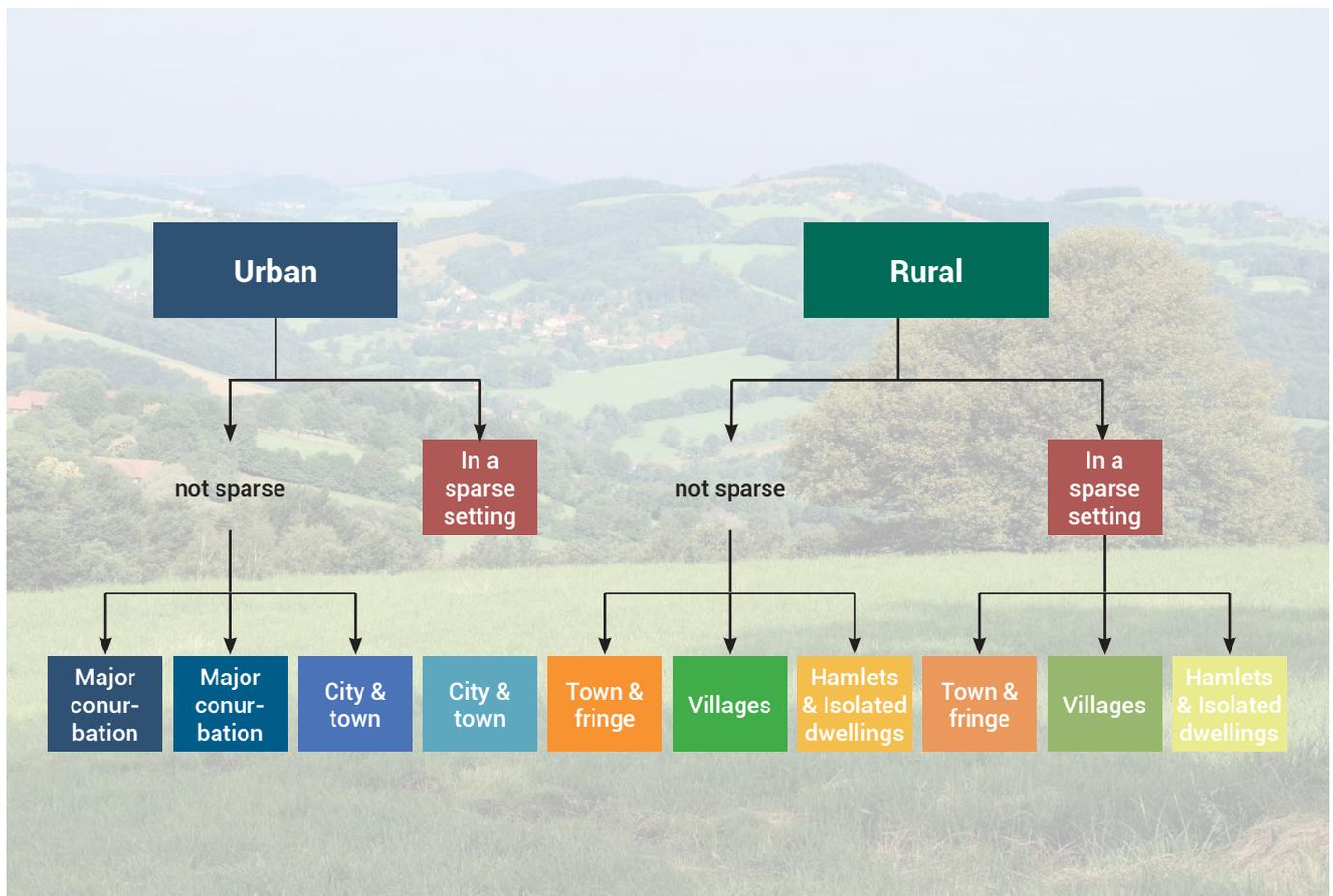


Figure 2.1 – Rural Urban classification at Output areas level (DEFRA, 2017)

The Rural-Urban classification uses data coming from Census 2011 at Output areas<sup>1</sup> to derive statistics. When data are not available, the classification can be also based on Local Authorities, again divided in six categories based on the percentage of the total resident population (Figure 2.2).

<sup>1</sup>The smallest geography for which Census 2011 data are available (average resident population of approximately 300 people).

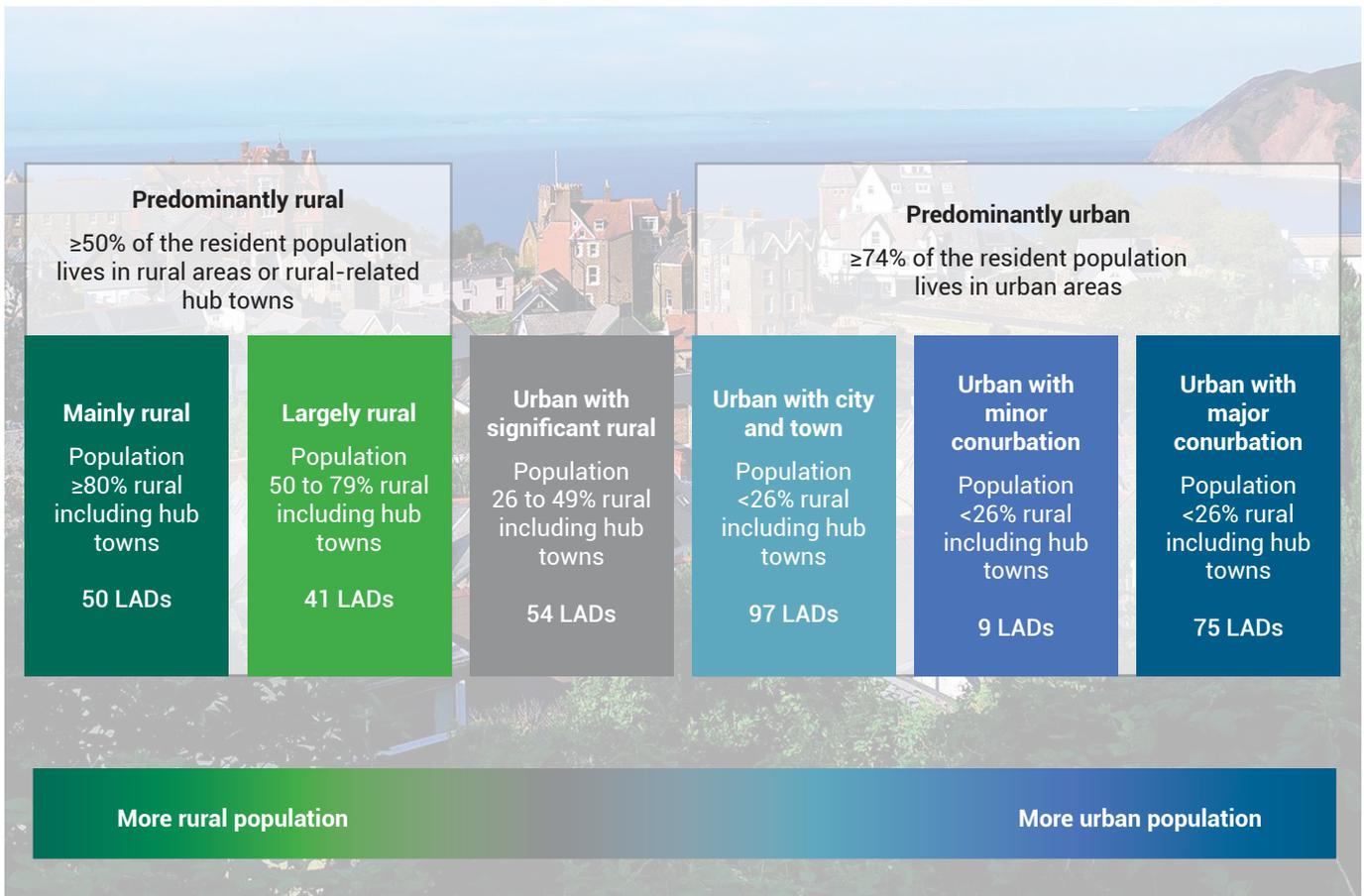


Figure 2.2 – Rural Urban classification at Output areas (DEFRA, 2017)

Other urban-rural classifications mentioned during the workshop by participants were the Scottish government Urban Rural Classification (2016) and the OECD classification.

The Scottish Government Urban Rural Classification uses population thresholds (125,000 for urban areas, 10,000 for small towns and 3,000 for rural areas) to define settlements and accessibility (drive time to the nearest urban area). This is available in six and eight categories. The latter further distinguishes rural areas into remote (areas that have a drive time between 30 and 60 minutes from a settlement with a population of 10,000 or more) and very remote areas (areas that are more than a 60 minute drive time from a settlement with a population of 10,000 or more).

Both the DEFRA and the Scottish Urban Rural classification then consider number of residents and population density for the settlements with accessibility to urban areas as a further factor to distinguish rural areas.

The interaction Urban/rural is further developed in the OECD Rural 3.0 people centre approach which uses three dimensions (objectives, type of rural and stakeholders) and a continuous view of territories. Rural is everywhere and interacts with urban in a bi-directional relationship that often crosses traditional administrative boundaries.

For the purpose of the AsSeTs for Rural Mobility project, the DEFRA classification at Local Authority district level is enhanced by looking at data which also measures accessibility. This considers both the physical networks (Road and Rail) and the digital connectivity. Public transport provision with its frequency and coverage of services is also used to measure **“how rural”** a place is.

## 2.2 Needs of rural users

People living in rural areas have the highest car ownership in the country. Residents are used to the flexibility that one (or two) cars in one household can provide, so it is quite hard to provide mobility services that can match the advantages and (perceived) costs of private cars. They are used to travelling longer distances and combine multiple trip purposes together to do everything in one day.

However, they have a positive attitude towards walking and cycling in the countryside and on rural roads. Major barriers and sources of concern which prevent a more consistent adoption of active travel are the safety (especially cycling on main rural roads where the number of “white vans” has increased recently) and the state of infrastructure (capacity, narrow lanes and potholes). In this respect, residents would welcome segregated paths for cycling and a pervasive network of walking paths to connect newly developed areas with town centres.

Public transport is often inadequate and inappropriate to meet the needs of both residents and occasional users, such as tourists or those travelling for business. Information on routes and timetable is difficult to find and understand: when it is available it is not fit for the purpose of travel. Most of the time the only alternative to the lack of public transport is a taxi. Mobility services in rural areas largely do not exist. Often trials and pilots are active for a short period, so people do not have the time to adapt their travel behaviour to a new routine and get used to a new mode of transport.

### Travel habits

Changing people’s travel habits and the mode of travel takes time and relies on consistent, clear messages on reliability, flexibility and capacity. Flexible on-demand mobility services or any adoption of integrated solutions to provide Mobility as a Service will require a better understanding of users, and their priorities, in order to improve the attractiveness of services and convince them to reduce the use of the private car.

Families with young children, young adults and mature adults will travel differently and at different times of the day. A combination of mobility services and a journey planner would give the assurance that flexibility is met whenever traditional public transport is not available to cover those journeys.

Rural users come with a diverse socio-demographic background and tend to be slightly older than the urban users. These users have concessions and incentives in the use of public transport, but face issues around different incentives for rail and buses (e.g. older people get free bus passes but only 1/3 reduction on rail) which also start at different ages (60 for the railcard and statutory pension age for bus passes). Mature adults are also the group that is more keen to use a Demand Responsive Transport (DRT) since it is perceived as an extension of the public transport, with 24% of ‘Town and rural heavy car use’<sup>2</sup> being early adopters for shared mobility service (DeMAND project, 2020).

### Social inclusion

Since the provision of public transport is so patchy or discontinued depending on the places served, there is an increased need to strike a balance between mobility services and the social need to guarantee the freedom/independence for young adults relying on parents to move around and for an ageing population, which will be increasingly dependent on these flexible mobility services.

<sup>2</sup> Department for Transport (DfT) Transport Users Segments <https://www.gov.uk/government/publications/climate-change-and-transport-choices-segmentation-update>

**Latent demand**

Participants agreed that people tend to move around based on what is available to them rather than what they would like to do. The nub of the problem is around understanding what are the required features of new mobility services which will provide a viable alternative to using the private car.

If there is little understanding of local unmet needs, it will be unlikely that people will support the initiatives.

Mobility services tailored around the rural user will require a connection with local users to personalise services. This requires a lot of prior work (e.g. effort, time and money) to test viability and make it attractive for use.

The data-driven approach which uses mobile network data is useful for revealing current travel patterns and testing alternatives. However, there is a limitation with regards to trips not being made, for example those who are restricted to their homes because of lack of available and appropriate transport.

It is important to give people a voice and to gather opinions to understand suppressed demand. There is a different ethos from those who have suppressed need versus suppressed want.

## 2.3 Perceived barriers to the uptake of on-demand mobility services

**Lack of suitable public transport services** disproportionately affects users, either during their outbound journey, when it is difficult to find a service that allows them to reach their workplaces / an appointment in time, or during the inbound journeys, when many services are not running after a certain time during the evening. It can be hard to find the same service or operator for both journeys, making it less cost effective for users.

**Integration** is a crucial point in the provision of mobility. It needs to be available at route, timetable (between different modes and operators) and at ticketing level in order to unlock good value for money for users.

**Lack of reliability at interchanges** and of flexibility in providing suitable alternatives are major causes for disregarding any integration between public transport and on demand services.

Vehicles used to run the service in rural areas are currently maximising capacity without really considering the demand in each area (e.g. elderly residents who are struggling to use double decker buses, social media used to update users or children missing out on afterschool activities because of a lack of services). There is a need to exploit existing fleets and make them visible on the same digital platform, where on demand mobility services (either commercial or community led) are booked.

### Sharing/demand responsive

In urban areas residents are hesitant about sharing a journey with strangers, mainly because of concerns about perceived comfort, privacy and safety. Most people (66%) are unlikely to consider a shared transport mode. Younger residents aged under 40 and those with household incomes of over £60K are most likely to consider shared transport (but only for leisure and shopping purpose) (DeMAND, 2020).

Although in rural areas this could be overcome thanks to the stronger community spirit, acceptance of delays and uncertainties in travel time remain major issues. Depending on the purpose of the journey the value of time might differ. Different segments of the population have a different perception and willingness to try new services.

There is a need to have a better understanding of demand responsive travel (DRT), particularly among the communities it is serving. This includes changing the perception of DRT services. Since first trials of DRT were targeting a specific demand, there is still a common perception that they are only for the elderly or disabled.

However, with the introduction of digitally enabled DRTs, there is also the added disadvantage that people do not know where to find the information, how to buy the tickets and where are the pickup/ stop locations.

There is a need to ensure communities are aware of what services are available, and where to find that information.

### Durability

A mobility service tends to acquire customers' loyalty once they try it.<sup>3</sup> For this reason, trials and pilots need to be followed by a longer period of service. Often, services need to be there for years (reliably) for people to change their habits. For example, if a trial only run for three months is unlikely that car drivers with an annual car park subscription will use a DRT service, even if in principle is a convenient alternative for them. Poor reliability of service, including coverage at the right times, is also perceived as a barrier.

If users are not able to fully satisfy their mobility requirements using a combination of mobility services, the use of a private car will still be required on a daily basis with a higher risk of maintaining the status quo, with regard to current modal usage.

<sup>3</sup> "Utility Function Development for Shared Mobility Services through Discrete Choice Modelling" DeMAND project report (Connected Places Catapult, 2020)

### **Digitalisation in rural areas**

Digital Demand Responsive Transit (DDRT) services are increasing rapidly in urban areas, but many rural areas are facing digital poverty and technological barriers in booking the trips. Mobility hubs can solve the issue partially, with intuitive and easy to use ICT technologies. This can provide an initial access to the on-line booking system, but other low technology access might be required (e.g. telephone, key fobs, contactless card) to allow all segments of the population to access the service and also monitor service usage.

Real-time, app-based bookings are also limited by the connectivity and signal coverage in rural areas, whilst phone booking seems more suitable for older generations. In Sevenoaks, for example, about 60% of the population requested a service using the phone versus 40% using an app.

### **Siloed marketing approach**

Currently there is an element of selective advertising where not everyone knows about all services as it may not be deemed to be suitable/needed by them. This has a detrimental effect on the mobility service, making it invisible to users and impossible to catch (unless pre-booked).

When advertising new mobility services, the target segment of population needs to be considered. For example, social media is not good to reach elderly and mature adults and bus adverts will not be seen by car users. Hence, an alternative plan to reach out different segments of population should be considered.

Moreover, there is a problem of services being focussed on one geographic area. For example, during the MODLE project trials in Bristol, only areas where bus services were operating were targeted because the DRT was running in integration with existing bus services. However, the demand modelling analysis revealed that DRT would have enhanced the catchment area so an extended area should have been targeted for the campaign (Franco et al, 2020).

Communicating the offer is also vital to advertise the mobility services to the users and remove any built-in bias. This is the case when new technologies are used to facilitate the uptake of the service, such as EV, electric bikes or connected and autonomous vehicles. Also, there is a need to get the market language right. For example, free parking is seen as positive encouragement for local economies but encourages car use as an unintended consequence.

### **Lack of innovation**

It was noted that a many pattern that were discussed during the workshop have persisted for 10 or 15 years. This may be due to a lack of political will, to austerity, and the private sector driving political view. People design their lives around provision, and if it is withdrawn, they will move towards the more flexible and least expensive option.

Most recently, the emerging trend of providing Mobility as a Service has created the need of reintroducing seamless integrated mobility services with first and last mile mainly delivered by DRT. The key issue over handling first/ last mile transport is a full understanding of travel patterns. Destination is as important as origin and moving goods and people together could become a viable option.

Consolidation of parcel deliveries (e.g. "Postbus") through an on-demand service or the provision of lockers is more common. Several applications in very remote locations (trials in Lapland, Finland) have created opportunities for merging people transport and parcel deliveries. However, when Royal Mail operated an extensive 'Postbus' network across rural parts of the UK, provision of services declined over time, with the last route ceasing in 2017. Hence, the business model to operate package delivery with passenger movements needs to adapt coherently to the type of rural area being served.

### 3 The ideal service

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**The ideal mobility service meets known demand but might also want to encourage latent demand. It needs to have a balance between a regular service and a flexible on demand one and must be integrated with the existing public transport ecosystem. This is linked to the lack of success when on demand mobility services try to compete with the more established fixed scheduled public transport. The new synergy will kick start new and more sustainable travel habits and will create a shift towards a renewed focus on pursuing a better service to rural communities.**

Buses running empty are not providing a good service, either for the community or the environment.

Many participants pointed out that there is not enough control on the type of bus services being deployed. Improvements to the services, such as on innovations, technologies deployed, and attractiveness, are operator led. However, following the Bus Service Act 2017 , local authorities have new powers (e.g. new enhanced partnership and advanced quality partnership) to work side by side with bus operators to set a shared vision to achieve more for bus passengers. It seems that rural areas have not capitalised yet on this change and further interventions are required in order to serve the demand for travel. Corridor-based bus services are too restrictive and the introduction of a range of mobility services would encourage this change.



### 3.1 Mobility hubs as access points to services

During the workshop, the idea of mobility hubs as an access point to mobility and services has been mentioned as a possible solution. However, investments are too short term to sustain the creation or transformation of potential hubs. Before the deregulation of public transport in the 1980s, public transport interchanges were already acting as a pole of attraction to encourage the integration of routes from rail, bus and underground (e.g. Tyne and Wear Metro stations in the North East were designed with this in mind). Many train stations in rural areas have retained this role but more investment is required to expand services available or create hubs in more remote locations.

A new generation of mobility hubs should create the support required to access a wide range of new mobility services, car clubs and active travel solutions to allow the rural users to tailor their transport choices to their needs. Moreover, it will be a way to make flexible on demand services more visible to the community with the adoption of fixed stops and door-to-door service (e.g. the Wiltshire Wiggly Bus).

The availability of alternative modes of transport can boost active travel in the rural area, but also allow the opportunity to try new technologies (e.g. e-scooters, e-bikes, EV) through the availability of car clubs or bike sharing schemes. Also, the hub can act as a catalyst to integrate community services run by volunteers, delivery points and can be shaped on community led priority needs. An example of an active mobility hub can be found in Wylam (Northumberland), where local services such as a bakery and newsagent are coupled with a business incubator, tourism information point, play group and rapid EV chargers to promote electromobility.

#### Personalised hubs

It is expected that each rural area will have their own priorities and needs, so a hub would need to include a mix of services that will support and sustain each community differently, possibly bringing services to people and not just people to services.

Each hub should have targets to review the benefits, but also considering the social importance of maintaining certain mobility services for the community. Hubs and DRT services will allow people to attend NHS hospital appointments and services that will support and sustain each community differently, possibly bringing services to people and not just people to services.

Each hub should have targets to review the benefits, but also considering the social importance of maintaining certain mobility services for the community. Hubs and DRT services will allow people to attend NHS hospital appointments and GP practices in remote locations, allowing rebalancing of resources and services.

Human contact and engaging with users will allow introduction of new technologies and remove barriers towards adoption of new mobility services and complementary services.

Logistics should be also included, so that moving people and goods will establish and validate new business models.

**A new generation of mobility hubs should create the support required to access a wide range of new mobility services, car clubs and active travel solutions to allow the rural users to tailor their transport choices to their needs.**

## 4 Data-driven approach to support NMS

### 4.1 Demand for services

Identifying demand for mobility services is conceptually simple, but more complex in practice. At the moment decisions are being based upon potentially 'old' data and none of the datasets are able to capture travel patterns. Mostly collected for other purposes, location-based data can either come from mobile network data or GPS traces.

Demand for travel is usually derived from surveys of residents, travel diaries and market research to reveal the preferences and transport choices for limited segments of population (usually those that requires to commute on a regular basis) or for specific attractions/ businesses (e.g. National Parks, GPs, hospitals).

There is a risk that not all segments of population are captured through on-line surveys, hence requiring an extra effort in acquiring information differently for those groups that are hard to reach. Most of the time these are those in need of on demand mobility because no other choice is available to them.

This qualitative approach does not offer a holistic view of what is really happening on the network and a more quantitative approach is available using location-based data. However, the granularity of the data can be an issue, either because it is too fine-grained or because data is not collected for the transport sector and, as such, some information may be missing.

#### Mobile Network data

New data sources, such as Mobile Network Data (MND), produced valuable insights to develop demand models for the South West of England (MODLE project, 2019) and the North East of England (DeMAND, 2020) to inform DRTs services in those regions. A good compromise by considering insights coming from both surveys and data was developed under the DeMAND project. The prototype demand model developed uses agent-based modelling to merge finer granularity travel patterns coming from mobile network data and users' transport preferences coming from stated preference surveys and discrete choice modelling.

However, there have not been many applications in rural areas, so how anonymised and aggregated MND perform is still unclear and requires further explorations to allow customers to confidently acquire good quality data to facilitate planning for on demand mobility services.

The mobile network signal can be patchy and not all the trips might be captured consistently. This is not linked to the lack of the latest technology (e.g. 5G), but in some areas even 3G is not available. This limits the accuracy of MND. Other limitations are linked to the size of each zone. If people stay within a single zone, internal trips might be difficult to capture.

#### GPS data

Given that most of the current mobility datasets are historic in nature, identifying a way to quickly collect data from vehicles operating in rural areas should be a priority when launching new mobility services. Connected vehicles could be a valuable resource to understand demand for travel, especially for short trips, and would help in compiling datasets that are sufficiently fine-grained.

Users tend to avoid the use of positioning apps due to concerns related to privacy and security. Sharing positioning data has never been popular and penetration of these data sources is limited and would not provide enough insight into the demand for travel.

More popular among users is the use of journey planners which provide a free estimates of travel times and possible routes (e.g. Google and Apple maps). However, these data sources might not reflect the actual travel times and patterns when people are only planning a journey, checking possible routes but not actually doing the trip. Also, as with mobile network data, they are costly due to a limited number of providers.

There is a need to create incentives for people to share data and demonstrate that there are benefits and advantages to sharing data. Alternatively, there might be a need to monetise users' data and guarantee privacy and confidentiality.



### Lack of a standard on how to use new data sources

Generally, there is a lot to offer around data and possible data analytics. However, there is not a standard or a method that can support Local Authorities in appraising the impact of mobility services before the launch. Demand modelling can also be beneficial, but again there is currently no process or framework that can underpin the launch of mobility services within the rural context.

There is a lot of transport planning around commuting, but in rural areas there is also a lot of non-commuting journeys. A holistic appraisal could incorporate gender and social inclusion (e.g. considering people with caring responsibilities, those who are no longer part of the workforce, the unemployed, those travelling for healthcare etc).

In rural areas, data is collected at county or unitary authority level, but it is quite aggregated and would not be enough to support the integration of public transport services with door-to-door mobility services. However, DfT Future of Mobility Strategy has at its core a data workstream which will provide a framework on data.

Other data that might be relevant to plan for on demand mobility services are data on public transport ecosystem. The Bus Open Data initiative sponsored by DfT is gradually opening the data from the bus industry. However, railway data is difficult to access, and it is impossible to match the various types of ticket with typical travel patterns.

### Performance of mobility services

In order to establish the success of new mobility services, data on performance should be captured so that all benefits in running the service could be quantified. If a mobility service is commercially viable it should generate enough revenue from running the service to be self-sustaining.

However, there is a question of how to consider the wider benefits that these on demand services bring to the community, especially if a service is community led or of a special community interest.

Wider benefits can include environmental, social, mental and health benefits which are not easy to measure directly but are ultimately the key benefits and could take many years to see the impact. Monitoring the changes in travel habits and benefits which improve the community and the liveability of the places should be part of the impact and performance of mobility services.



## 5 Impact of COVID-19 lockdown

Although the workshop was not designed to consider the transformations and impact on travel habits during the COVID-19 lockdown and the transition towards a "new normal", participants talked also about the conditions and limitations experienced in rural areas.

Rural mobility provides access to jobs and services and, in many cases, there is a close bond with the nearby urban areas. Commuting for work was no longer possible, so the time released for this activity has been use differently.

### **Community spirit**

During COVID-19 lockdown rural areas have rediscovered their own individuality and independence with local producers and organisations stepping up in volunteering and providing services to all local communities.

Hubs naturally formed from existing facilities to organise door-to-door deliveries (e.g. food, prescriptions) and provide services to isolated residents, but also checking on them and on their mental health. For example, Northumberland National Park acted as a hub in Northumberland with volunteers collecting orders and delivering food and other necessities.

### **DRT and active travel**

A reduced public transport service provided connectivity for key workers with adaptations put in place to prevent the spread of the virus. However, there was a general feeling that usage and patronage will go down as a consequence of the pandemic lockdown.

Instead, people rediscovered healthier lifestyles, walking and cycling in the local areas without the need to drive. Also, local demand for travel and high-quality produce increased. On demand mobility services thrived during this period thanks to their ability to flex routes and serve the demand dynamically.

### **Social media and digital technologies**

The lockdown acted as a catalyst to boost digital connectivity and use technologies to ease isolation and pay for services, either by phone, web or mobile apps. The shift was rapid, and people drastically changed their behaviours, being more open also to a new way of fulfilling their needs.

### **Rapid shift in habits**

Participants also queried if this rapid shift in habits will revert back to normal once the pandemic will be over.

In order to manage risks during the emergency, new designs and practices were adopted to make public transport and DRT safe to use. Generally travelling in a minibus and sharing the vehicle with fewer people felt a safer and more convenient option compared to mass transit, which would need to change and adapt to new requirements.

Generally, people felt that the lockdown provided the opportunity to innovate and create a transition towards a healthier lifestyle with the discovery of high quality and local produce and a renewed appetite for active travel in communities with high car ownership.

## 6 Conclusions

**During the stakeholder engagement workshop organised for the “Assessing Sustainable Transport Solutions (AsSeTS) for Rural Mobility” project, participants joined an on-line webinar to discuss needs of rural communities and barriers to the uptake of new mobility services in rural areas.**

Two case studies were presented for County Durham and Northumberland. Data analysis using the synthetic population for the North East of England developed under the DeMAND project, showed similar travel patterns compared to urban areas. However, as also confirmed by the National Travel Survey, people living in rural areas travel more, and for longer, to reach jobs and services. Public transport is generally inappropriate and/or inadequate to satisfy their mobility needs, so rural users rely much more on the use of private car (33% more car trips/person than national average and 66% more miles travelled per person than urban cities and towns).

As a result, there is very little room for rural users to change their travel behaviour and it would be hard for any new mobility services to be introduced without the necessary support. DRT and new mobility services cannot compete with cars, but a more social inclusive mobility offer can kickstart a virtuous circle and serve the unmet needs of different segments of the rural communities that do not have access to a car.

Different segments of the population come with different drivers. In order to maintain social inclusion (e.g. young adults fully reliant on parents or elderly with no car available) and support an ever-increasing aging population, the integration between public transport and new mobility services is welcome as a step change in the rural communities.

This vision integrates existing public transport services with flexible door-to-door services, which can be delivered through different modes and schemes.

The pivotal change to allow the rural users to access a new range of modes is the re-establishment / creation of mobility hubs that will provide a range of services for people (e.g. e-bikes, e-scooters, DRT, car clubs) and goods (lockers and consolidation centres for door-to-door deliveries).

However, hubs should be personalised and tailored on the community needs, rather than be a standard offering across the very different rural areas.

Among the main barriers in remote locations, digital connectivity and mobile signal strength can be an issue in booking DRTs and on demand services. There is also an issue of digital poverty and lack of expertise to use on-line web or mobile apps booking systems and would require assistance.

Rural communities have seen very little change in their travel behaviour in the last decade, both from a lack of investment in public transport and the high flexibility offered by high car ownership. Much of the shift in demand for travel is due to other drivers such as a healthier and greener lifestyle far from urban areas and the limitations linked to an aging population.

A holistic approach is required to remove targets linked to administrative boundaries, supported by a data-driven approach linked to travel patterns rather than disconnected trips. New data sources can support the setup of new mobility services and monitor the changes in rural mobility due to the introduction of on demand mobility.

The combination of mobile network data analysis and qualitative surveys to identify latent demand can provide the holistic view to support Local Authorities in the use of new data sources. This will provide evidence on changes of transport choices and travel patterns and increase the level of confidence in the use of new data source to better understand rural mobility.

The current pandemic related crisis has introduced a level of uncertainty in the way residents travel. However, it can be seen also as an opportunity to capitalise on the rapid changes in travel behaviour and habits which happened during lockdown.

There is a risk that rural areas will revert to pre-lockdown travel behaviours as the restrictions are lifted. Hence it is imperative to implement initiatives designed to support changes in travel patterns and introduce innovations in the way rural citizens travel. The introduction of an integrated offer of mobility services calibrated on users' needs can be rolled-out through targeted pilots and the establishment of mobility hubs that would sustain the changes over time.

## 7 Next steps

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**In the next phase of the AsSeTS for Rural Mobility project, the attention will focus on three case studies, which are a comprehensive representation of current challenges for rural settings. The study will produce a data landscape on travel patterns and habits and surveys to understand choices behind residents' travel behaviours.**

The 2011 Rural Urban Classification, developed by DEFRA, is an Official Statistic and is used to distinguish rural and urban areas. The Classification defines areas as rural if they fall outside of settlements with more than 10,000 resident population.

During preliminary analysis, developed at village level, it was noted that residents travel to nearby villages and urban areas, hence the data landscape will focus on a larger area to understand the full extent of the travel dynamics.

The project has selected three areas that cover the Predominantly Rural categories in the Urban-Rural Classification (DEFRA):

- **Mainly Rural** (8.9% of UK population based on 2011 Census data)
- **Largely Rural** (11.9% of UK population)
- **Urban with Significant Rural** (13% of UK population)

Criteria considered in the selection are:

- **Population criteria:** based on the DEFRA Rural-Urban classification
- **Settlements distribution:** a variety of rural settlements (Market town, rural town, village, dispersed), to guarantee transferability to other geographies
- **Public Transport Ecosystem:** either fully developed or inadequate to satisfy residents' needs. The study will offer an opportunity to revitalise the integration with fixed-scheduled services and understand how community-based services fit in the mobility landscape
- **Levelling-up:** often perceived as areas of low demand for travel, the rural settlements are unable to attract funding, receive support to build a holistic vision to drive change in the wider region
- **Collaboration:** to ensure designated local authorities can feedback in the process and community engagement is embedded in the process.

Based on these criteria and data examined, recommendations for the three case studies for AsSeTS for Rural Mobility are:

- **Northumberland for Mainly Rural**
- **South Somerset for Largely Rural**
- **Essex for Urban with Significant Rural.**

The stakeholder engagement continues with a bottom-up approach where residents will be asked what type of services they would like to see in their areas, and what characteristics they should have. In this phase the project will steer their imagination, moving forward from their comfort zone. Technologies and different ways to manage their journeys with different tools and different type of services will be considered. This will include those that are not on the market yet, such as connected and autonomous vehicles and drones to manage deliveries in remote locations.

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### CASE STUDY

**WHO WE ARE**  
The Connected Places Catapult (CPC) is an independent, trusted, expert broker operating at the intersection between the public and private sectors and between local, regional and national decision making. We promote UK innovation and foster relationships between government, academia and industry providing support and solutions for innovators as commissioning their projects and research. With our deep expertise in technology, we bridge the gap between buyers, suppliers, innovators and industry. Our agile approach enables us to convert our partners to act rapidly to create new market collaborations responding to public funders and industry needs. We host demand for innovation to unlock wider economic and environmental benefits.

**CPC has spearheaded the transport modelling community in the development of agent-based models. The use of mobile phone data and the methodology developed in this project will catapult the industry into the new realm of alternative transport modelling.**

**NBA Saini - Principal Transport Modeller, Department for Transport**

**Our work with Connected Places Catapult has showcased how unique aspects of mobile network data, in this instance activity chains, can be used to build synthetic populations to better understand how populations move and behave. We're delighted to collaborate with CPC to combine their agent-based modelling expertise with our mobile network data expertise to develop innovative mobility solutions.**

**Data Weir - Head of Data and Analytics, O2 Motion, Telefonica UK**

### DeMAND Transport modelling to highlight new routes for urban mobility

**Challenge**  
Local and transport authorities in the UK currently are unable to assess the impact that New Mobility Services, Demand Responsive Transport and Mobility as a Service might have on travel behaviours. Autonomy and flexibility are changing the way we travel. However, the transport models used by local authorities to assess the demand for travel are unable to consider the full complexity of travellers' needs and the contribution shared mobility makes in a well-established public transport system. The shared mobility market is entirely technology-driven and is growing exponentially. None of the new mobility services have demonstrated to be commercially viable in the long term.

A key change from traditional transport models is the need to represent the door-to-door users' journeys and the multimodality where on demand shared mobility services are integrated with fixed scheduled public transport systems. Department for Transport (DfT) is looking at new methods to predict the demand for new mobility services and provide Local Authorities with tools to set up multimodal and seamless integrated solutions helping users to travel smarter.

**Solution**  
The 2019 DeMAND project developed a large-scale agent-based model, which represents a digital twin for the Tyne and Wear and is best placed to appraise the changes in travel behaviours when new technologies or trends emerge. This can either be the introduction of a new mode of transport, such as shared mobility e-scooters and bike sharing schemes or digitally powered Demand Responsive Transport.

Tyne and Wear was selected as the study area for the urban prototype to maximise the transferability of the modelling tool. The region has the lowest car ownership in the UK and a preference for using public transport. The multimodal public transport has the highest bus use per head of population in the North of England and extends to the Tyne and Wear Metro, 844 bus services and 230 rail services, the Shields Ferry and Newcastle-International Airport.

The DeMAND model represents a synthetic population of nearly 650,000 agents (individual people) replicating the transport choices and preferences within Tyne and Wear. Each agent bears the socio-demographic characteristics, spatial information and daily activity schedules thanks to the use of anonymised and aggregated mobile network data, sourced from O2 Motion (Telefonica).

Mobile Network Data provides up-to-the-minute insights on travel demand and the complex variability of people's travel behaviour plus the additional demand coming from logistics activities at local and national level as kiosk and van drivers are also captured. The methodology used applies machine learning to speed up the data from two behavioural models developed following a survey of residents providing insights on attitudes towards shared mobility in Tyne and Wear. Ultimately the DeMAND prototype represents the first step towards the integration into one platform of different transport modelling tools (private, public and freight transport) removing existing divisions and siloed approaches.

**Outcomes**  
An open source-based platform MATSim (Multi-Agent Transport Simulation) has been used to create the agent-based model including transport demand and population behaviour to be simulated. A key innovation in large-scale modelling applied movement of people, involving different modes and more than one origin and destination per agent. The model allows for the testing of different policy interventions and the demand for new mobility services in isolation or when integrated with existing benefit for users and operators.

The prototype generated valuable insights for Nexus, the Tyne and Wear Passenger Transport Executive, which supported the region and to support the North East Combined Authority Future of Mobility Strategy.

**Key characteristics of the model are:**

- Synthetic Population of 647,768 agents (58% of total population) thanks to a complex travel pattern from internal trips to 21 trips in one day.
- Agent-based model built for an average weekday at higher spatial and temporal granularity to study behavioural changes

**CPC creates value**

- CPC has been recognised as a leader in innovation and thought leadership in the Intelligent Transport Systems and the uses of big data winning the Industry Award for 2019 for Europe, Middle East and Africa during the ITS World Congress Hall of Fame.
- The CPC Modelling team have built up unique experience in the use of Mobile Network Data achieving quick generation of a synthetic population for agent-based modelling. Also, the relationship developed with the O2 Motion team (Telefonica) allowed to open the market for the activity-chains dataset.

**Benefits**

- Enables DfT to shape the evolution of future demand models, mobility services and MaaS schemes.
- Introduces a culture of sharing real collaboration with other organisations and demonstrates the transferability of the modelling tools to open the market for the activity-chains dataset.

**After the introduction of mobility service across the 24 hours, education, leisure, tourism, defined as local and long underground and rail.**

- Agents' characteristics derived by socio-demographic and decision processes are integrated in the agent-based model thanks to behavioural models developed from data gathered from a survey of residents.

The analysis of the survey results revealed residents' attitudes towards shared mobility.

- Early adopters of the shared service are car drivers (Older less mobile car owners' and 'low and mid-high car user' as defined using the DfT population segments) less likely to choose shared transport.
- Although initial uptake of shared mobility in case of rapidly generated trust in customers, results from the behavioural models suggest the adoption of a short walk to reach pick-up points rather than provision of a door-to-door service to users.

**After the introduction of mobility service across the 24 hours, education, leisure, tourism, defined as local and long underground and rail.**

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- Although initial uptake of shared mobility in case of rapidly generated trust in customers, results from the behavioural models suggest the adoption of a short walk to reach pick-up points rather than provision of a door-to-door service to users.

**The Connected Places Catapult recognises that agent-based models, like the one developed in DeMAND, are the next steps confidence in a wider adoption. Further investment is required to develop the tools needed to a standard which will inspire Mobile Phone Network Data, sensors and Internet of Things (DeMAND Project).**

**Where all legacy datasets are present but often outdated and not reflecting the current travel patterns from users, it continues to work with Nexus to help them derive value from this model and will work with local authorities and universities to pilot the DeMAND agent-based model methodology and explore and support the uptake of agent-based modelling in transport.**

**Find out more about the Connected Places Catapult and how we can help you develop the future skills that address the needs of your organisation please contact [info@cp.catapult.org.uk](mailto:info@cp.catapult.org.uk)**

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## Appendix A: Agenda

9.45am – 10.00am	Join the call/virtual networking and coffee
10.00am – 10.40am	<b>Plenary Session</b> <ul style="list-style-type: none"><li>• <i>Introduction to AsSeTS for Rural Mobility Project and Workshop aims</i> (Dr Patrizia Franco, Principal Demand Modeller, Connected Places Catapult)</li><li>• <i>DfT perspective</i> (Heidi Smith, Senior Policy Advisor, Future of Transport, DfT)</li><li>• <i>Instructions for Breakout sessions</i> (Dr Patrizia Franco)</li></ul>
10.40am – 11.50am	<b>Break-out Sessions</b> <ul style="list-style-type: none"><li>• <i>Introductions/Icebreaker</i></li><li>• <i>Discussion of key questions</i></li></ul>
11.50am – 12.10pm	<b>Q&amp;A</b> <i>Moderated by Heidi Smith</i>
12.10pm – 12.15pm	<b>Closing remarks</b> <i>Next steps for AsSeTS for Rural Mobility</i> (Dr Patrizia Franco)
12.15pm – 12.30pm	<b>Virtual networking</b>



## Appendix B: List of attendees

Name	Affiliation
Marian Marsh	CoMoUK
Dr Patrizia Franco	Connected Places Catapult
Andrew Green	Connected Places Catapult
Dr Shyma Jundi	Connected Places Catapult
Dr Fabio Galatioto	Connected Places Catapult
Phil Moorcroft	Connected Places Catapult
Philipp Thiessen	Connected Places Catapult
Dr Djibril Kaba	Connected Places Catapult
Michael Edwards	Connected Places Catapult
Heidi Smith	Department for Transport – Centre for Connected and Autonomous Vehicles
Claire Gregory	Department for Transport – Centre for Connected and Autonomous Vehicles
John Baverstock	Department for Transport – Transport social research and evaluation
Eleanor Chappell	Department for Transport – Transport social research and evaluation
Robert Sykes	Drop A Pin
Asiya Jelani	Drop A Pin
Andy Haddon	Earth Doctors
James Hopkins	Essex County Council
Rachel Price	Essex County Council
Alistair Kirkbride	Gridsquare
Julie Gibbon	Haltwhistle Community Partnership
Trevor Brennan	Hertfordshire County Council
Stelios Rodoulis	Jacobs
Jenny Milne	JLM and Post Graduate Research at University of Aberdeen
Renee van Baar	Midlands Connect
Dr Paul Cowie	Newcastle University – Centre for Rural Economy
Dr Thomas Zunder	Newcastle University – School of Engineering
Andy Dean	Northumberland Community Action (CAN)
Neil Easton	Northumberland County Council
Duncan Wise	Northumberland National Park
Ralph Smith	Pedal
Nick Bromley	Positive Focus
John Clark	South Somerset District Council
Joe Walsh	South Somerset District Council
Stephen Joseph	Stephen Joseph Associates
Jonathan Padmore	Tactran
Malcom Chainey	Tyne Valley Community Partnership
Fiona Forsythe	Tyne Valley Community Partnership
Dr Kate Pangbourne	University of Leeds - Institute for Transport Studies
Prof Greg Marsden	University of Leeds - Institute for Transport Studies
Rachel Skinner	WSP
Roger French	

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