The challenge of future carbon and emissions reduction for rural communities

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SUMMARY

The government's policy to prevent the sale of internal-combustion-powered private cars and light vans by 2030 is a serious societal challenge across the UK in general and for rural communities in particular.

Whilst accepting the overwhelming need to decelerate the rate of climate change, it should be recognised that a one-size-fits-all approach to decarbonising transport will not achieve the desired outcomes. It could be argued that the government's Road to Zero industrial strategy is urban-centric and does not reflect adequately the different needs across the UK. This paper aims to consider a range of possible outcomes for the rural community of current options for transport decarbonisation.

The paper discusses what makes the rural environment unique, meaning it requires different consideration in policy-making. We know, for example, that the population profile of a rural environment is very different from an urban profile combined with the remoteness of some areas makes the economics of transport very different from urban settings. This in turn makes decarbonisation a potentially different challenge to face.

A feature of the rural environment is there are vast differences between rural areas. Any average data masks the considerable variations between areas which will impact levels of adoption of transport solutions and change. In developing policy there is often a risk of looking at the extreme ends of the scale of ruralness, and so we need to be conscious of generalising too much and consider solutions along that continuum.

The rural economy contributes £261 billion (more than a third of that of urban conurbations), but from only 17% of the population. (Rural Economic Bulletin for England, 2019) As a result, there is a risk that evolving policy options for emissions reductions neglect the important role rural communities play in our economy, society and indeed the delivery of the Road to Zero objectives. That isn't to say the rural economy hasn't a role to play in decarbonisation, but more that different levers may need to be considered and decisions need to be made within the context of the needs of the rural environment.

It is clear that in rural communities the dependence on the car is significant, impacting both travel time and cost. Public transport, whilst often a major option for urban environments, has had less investment in rural areas. The economics of scale mean that the provision of public transport is often financially challenged.

Often, when considering transport in rural areas, there is a focus on passenger. However, the existing and growing demands of freight and logistics in rural areas present challenges and opportunities that need to be met and therefore this paper responds the needs and challenges for both passengers and freight.

Rural industries (such as farming, food processing and healthcare) tend to be particularly dependent on freight movements compared to, say, office-based or education organisations. This means that plans for decarbonising goods movements may disproportionately

impact rural economics. This is also the case in a Covid-19 world where online shopping has proved to be a vital link for rural communities (especially given the older nature of the population), leading to more dependence on efficient freight movements.

For decarbonisation, a number of issues need to be considered in the context of the rural environment. These include the impact and role of the local energy supply, with opportunities for rural areas to become power generators for the community enabling local decarbonisation.

In addition to the economics of decarbonisation, another issue to be considered is the provision of infrastructure for electric vehicle charging or hydrogen fuelling. This needs to be alongside the phasing out of petrol/diesel vehicles, where there is currently a huge dependence, and the banning of which will have a disproportional impact on rural communities.

There is considerable evidence that services sharing premises and co-locating with each other at hubs, a solution often cited for urban environments, could also present opportunities for rural areas. This may enable cost savings and generate more footfall, through, for example, the consolidation of people and of goods.

As with urban areas, the opportunities that mobility-as-a-service (MaaS) provide could support the Road to Zero strategy. However, a clear lead needs to be provided through a framework for local authorities to work within. An extension of this is the opportunity to deliver integrated solutions – for instance, combining passenger and goods transport, sharing public and private services – and cross-sector working.

Our research has concluded that digital capability is a key enabler to allow for access to shared assets, and this would seem to be one of the barriers to fundamental change in rural areas.

What is clear in this research is that, as with many other decarbonisation plans, the answer does not reside on one single solution. Of prime importance is the requirement to 'rural-proof' decarbonisation policies and plans, and rural requirements should be considered as early on as possible in the development of decarbonisation levers.

A clear message from those involved in the research for this paper is that the journey to zero will be difficult without considered communication and engagement with rural communities and businesses from government. If policies do not address the unique challenges of decarbonisation in the rural environment, there is a risk that people and business will suffer further social and economic disadvantage.

INTRODUCTION

The government's policy to prevent the sale of internal-combustion-powered private cars and light vans by 2030 is a serious societal challenge across the UK in general and rural communities in particular.

This paper includes comment and contributions from CILT members who expressed an interest, including those from the successful West and North Yorkshire group 'coffee morning' attended by members from across the Institute. The initial paper that was circulated to members of Public Policy Committee and Freight and Logistics Policy Group continues to be used as a framework for this report.

Whilst accepting the overwhelming need to decelerate the rate of climate change by, among other measures, transport decarbonisation, it should be recognised that a one-size-fits-all approach is likely to have disproportionate societal effects on already challenged rural communities. Equally, however, in the space of the next 15 years the majority of the post-war Boomer generation will have given way to Millennials and Generation Y, including in rural areas, and these groups embody a different set of needs, aspirations and values from the existing population.

The challenge we have is to understand and plan for the long-term impact of policy. Decisions will have to be made now that are based on our current knowledge, experiences and expectations. This is made more complex given the position where the long-term impacts of Covid-19 and Brexit on personal and business behaviours are unknown.

As a contribution to the suite of CILT reports responding to the government's Road to Zero Strategy, this paper considers the assumptions behind current government transport decarbonisation policy in the context of the societal and infrastructure requirements of present and future rural communities.

More recently we have used this document as the basis for an extensive response to the Future of Transport: Rural Mobility, call for evidence.

Through its Public Policy Committee and regional policy groups, CILT has been involved with the dissemination of the original Department for Transport (DfT) Road to Zero Strategy since it was launched. This has included attending stakeholder meetings at DfT and advising at ministerial round tables. CILT recently published its *Routes to Net-Zero 2050: 2020 Year-End Summary Report* that has helped to inform this review.

What does rural mean?

The meaning of the term rural is variable. It often refers to areas within a country that are less densely populated. There are different types of rural areas, depending on how accessible they are from urban areas. These range from the rural urban fringe, to the extreme (remote) rural areas.

Definitions in the UK seem to be based on population, not on particular characteristics. The Rural Urban Classification is used to distinguish rural and urban areas and defines areas as rural if they fall outside of settlements with more than 10,000 resident population.
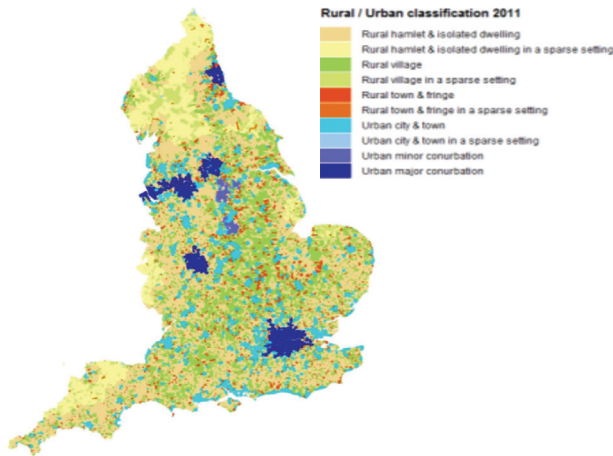
Figure 1
Rural-urban classification for census output areas in England
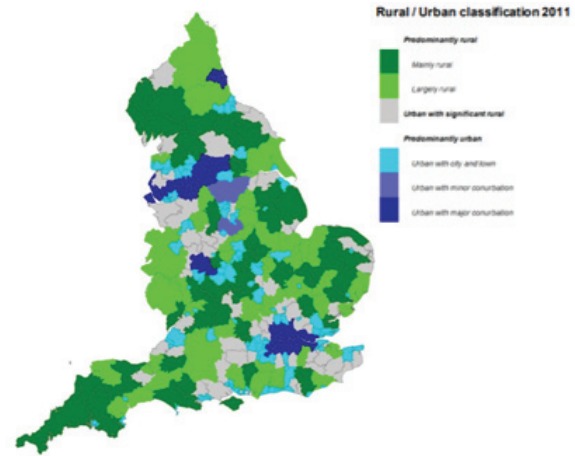*(DEFRA, 2018)*

Figure 2
Local authority classifications
(DEFRA, 2018)

Figures 1 and 2 show the accepted UK census classifications of rural areas in England. This may change with the 2021 Census.

An observation here is that rural areas with the same classification may show quite different features – for example, the Isle of Wight is classified as mainly rural, the same as Cornwall.

The makeup of rural areas can impact the consequences of policy decisions – for example, the impact of a policy on a rural community 4km from an urban centre may be very different from the impact of a community 40km away.

Whilst land area definitions are important, what is more important in examining policy is the transport characteristics of different communities. The rest of this section explores this.

Rural blindness

Midlands Connect in its: *Future of Rural Mobility Study Summary Report and Recommendations* (Midlands Connect, 2020) highlights:

'*The make-up of our rural communities and businesses is different to [sic] more urban areas, and therefore, the transport and access issues faced by our rural communities and businesses are substantially different to [sic] those in more urban settings.*

'*Our research also reflects this conclusion and highlights that the impacts of the policy choices for low carbon transport need to consider the rural environment as well as the more urban areas of the country.*'

Midlands Connect cites several examples of the different features of rural economies:

• 24% of the rural population is over 65, compared to 16% in urban areas; the only age group where there is an outward migration from rural areas is 16–25-year-olds

• Manufacturing and construction constitute slightly larger shares of rural than urban economies (10.3% of businesses in all urban areas are in construction compared to 11.5% in all rural areas; 4.6% manufacturing in all urban areas compared to 5.3% in all rural)

• Rural businesses are often microbusinesses that serve and support wider supply chains

From a personal travel perspective, the car features as the most predominant transport option in rural areas, often with limited alternatives. Some 95% of households in rural areas (outside of towns) have access to a car, compared to 66% in urban conurbations. Some 75% of trips in rural areas are made by car, compared to 52% in urban conurbations. (2018 National Travel Survey)

This is a particular problem for young people under 17 and others unable to drive or those with no or limited access to household cars. For many this means dependence on parents or others, removing the independence available to their urban contemporaries. This lack of independent mobility for youth is believed to be a significant factor in the out-migration, as previously mentioned.

Our research suggests that a lack of rural-proofing in government policy can be seen in a number of sectors besides transport, such as land use planning and healthcare provision. Consultation with CILT members highlights that the current planning around decarbonisation does not adequately cover rural communities, either in terms of the positive role they can play or in ensuring policies do not have unintended negative consequences in the journey towards zero-carbon objectives.

Objective

This paper aims to consider a range of possible implications for rural communities of current options for transport decarbonisation and introduces alternative options that may have a more measured and evolutionary impact on rural communities. It examines infrastructure investment, spatial and transport planning, societal change and energy futures in the context of decarbonisation options for rural areas.

POLICY CONTEXT

The original document considered in our review is *The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy* (DfT, 2018). Although this is a very comprehensive document, the word 'rural' is mentioned only six times, three in relation to motorway service stations providing electric vehicle charging points.

The rural economy contributes £261 billion a year, more than a third of that of urban conurbations, but from only 17% of the population. (Rural economic bulletin for England, 2019) It is clearly important to consider the important role that rural communities play in our economy and society when planning the delivery of the Road to Zero objectives.

Although the delivery of the Road to Zero transport emissions policy is primarily the DfT's responsibility, it is by no means the only government department responsible for matters affecting rural communities and their lifestyles. The Department for Environment, Food and Rural Affairs (DEFRA) and the Ministry of Housing, Communities and Local Government (MHCLG) have important, indeed critical roles to play among other departments.

Nor are central government departments the only governmental bodies to affect life in rural communities; healthcare organisations, as well as the Committee for Climate Change, also have major impacts.

DEFRA aims

DEFRA has two key aims relevant to the discussion within this paper, outlined in Table 1.

TO MITIGATE AND ADAPT TO CLIMATE CHANGE

How DEFRA will achieve this:

Deliver statutory climate adaptation obligations under UK Climate Change Act and drive delivery of the National Adaptation Plan to strengthen resilience to climate change (contributes to SDG 13)

Support the Department for Business, Energy and Industrial Strategy (BEIS) in the delivery of the Clean Growth strategy to reduce greenhouse gas emissions across DEFRA group sectors (agriculture, waste, fluorinated gases, forestry and land use) (contributes to SDG 13)

Oversee and report annually on progress towards meeting Greening Government Commitments, demonstrating the UK government's determination to operate in an efficient and sustainable manner (contributes to SDG 13)

TO ENCOURAGE THRIVING RURAL ECONOMIES AND COMMUNITIES

How DEFRA will achieve this:

Work with MHCLG to ensure the UK Shared Prosperity Fund will help rural businesses and communities

Work with other government departments on business support, digital connectivity, broadband, housing, education, healthcare, transport and crime in rural areas (contributes to SDG 8)

Strengthen rural communities, including through the £3 million Village Halls Fund and implementing our commitments in the government's Loneliness strategy

Embed rural proofing across government so policies take proper account of needs of rural businesses and communities (contributes to SDG 8)

Table 1, *DEFRA, 2019.*

Ministry for Housing, Local Government and the Communities

The MHCLG is the government department responsible overall for the activities of local government in England, which it can influence primarily through the control it exercises on the annual financial allocations to individual local authorities (county, district, and unitary). Besides block grant allocations, there are also numerous and specific grants that can affect the actions local authorities can take in rural communities. Education is one of the main services provided at a local level and has a major impact on transport, given the volume of traffic generated by schools and colleges and the effects that has on rural activities and movements.

The MHCLG also influences two other key areas affecting rural life: housing, and land use planning. It produced the white paper: *Planning for the Future* (House of Commons Research Briefing, 2020) and is responsible for producing national planning guidance that sets out the location, density, scale and design for future development, including housing. Such development, if of sufficient size and scale, will require planning permission granted through applications made to mainly, but not exclusively, local district and unitary authorities, which act as the guardians of local public interest. The role of local councils (parish and town councils) should not be forgotten; they can have an important influence on what takes place within their immediate neighbourhoods.

Healthcare

One of the most critical aspects surrounding rural life and rural communities and how that can affect the operation of the rural economy concerns the location and availability of healthcare facilities and services. The more remote the area, the greater the challenges and distances involved in accessing healthcare facilities. Such facilities and services are seen as critical elements to rural life and wellbeing, as well as having significant impacts on transport.

A particular complication is the organisation of healthcare. Hospitals, clinics, doctors' surgeries are part of the NHS and operate through localised trusts. Social services – for example, social and mental care – are the domain of county and unitary local authorities, through which various aspects of care are commissioned and frequently contracted to private sector providers. Availability and coordination between these two streams of healthcare can sometimes prove difficult. What is evident is that access to/from many of these facilities – hospitals, surgeries, social care homes –is primarily dependent on vehicular availability, be it for visitors, health workers, goods movements and drivers or volunteers helping out. NHS Ambulance Trusts operate patient transport for emergencies and to take non-emergency patients to and from hospital. Changes in the availability or location of facilities/services can cause difficulties (involving complicated travelling arrangements) and present special challenges for rural lifestyles especially if rural communities are expected to move towards a less carbon-dominated economy.

> *One of the most critical aspects surrounding rural communities concerns the location and availability of healthcare facilities and services. The more remote the area, the greater the challenges and distances involved in accessing healthcare facilities.*

Conclusion

It is important for all areas of the country that when planning for decarbonisation a coordinated effort is made between different government departments. However, it is especially important for rural areas, where the reliance of carbon-based transport is predominant, with few practical alternatives available.

TRAVEL CHOICES AND FUTURE TRENDS

There are a number of trends within the impacting transport options in rural areas:

- **Age profile:** 24% of the rural population is over 65, compared to 16% in urban areas; the only age group where there is an outward migration from rural areas is 16–25-year olds; options for change therefore need to consider the age profiles not only in terms of the type of transport used, but also how transport is accessed

- **Time/distance:** rural areas are on average nearly twice as far from their nearest services as urban areas, including town centres and hospitals (hospitals by public transport (34 minutes/61 minutes) and by car (18 minutes/26 minutes)); access to education and training is similar, with secondary school students from villages, hamlets and isolated dwellings travelling 7 miles on average, compared to 2.8 miles in an urban conurbation; it is worth noting that a feature of the rural environment is there is vast differences between different areas and so any average figures mask the considerable variations in areas

- **Availability:** rural communities have fewer transport choices

The above features of rural areas impact access to and take-up of alterative, low-emission choices, including electric vehicle options, and these trends impact how rural areas are able to contribute to the decarbonisation strategy.

An interesting observation is the number of younger people obtaining driving licences. Evidence shows that driving licensing among young people peaked in 1994, with 48% of 17–20-year-olds and 75% of 21–29-year-olds holding a driving licence. However, by 2014, driving licence holding had fallen to 29% of 17–20-year-olds and 63% of 21–29-year-olds. (RAC Foundation, 2014)

It will be important to understand how this maps against licence uptake in rural areas. Some studies have suggested that those who live in rural areas are the most likely to hold a full licence and retain dependence on the car.

Midlands Connect published: *Future of Rural Mobility Study Summary Report and Recommendations* in January 2020. The report is informative and is based on survey information, recording options for policy development in a number of charts and matrices. The report includes a Future of Rural Mobility Tool Kit encompassing:

- New ways of moving people

- Reducing the need for people to move

- Changing how services are provided

- Taking goods to people covering new technologies

These themes are explored in this research.

Travel by public transport

Low population density makes practical and affordable public transport difficult to provide in rural areas. However, accessible transport is a lifeline for many rural residents. Rural areas are very car dependent, in part perhaps because public transport is inadequate.

The group Campaign for Better Transport notes in its paper: *The Future of Rural Bus Service*, that there has been a spiral of decline in rural public transport, which has been exacerbated by pressures on local government finances in recent years resulting in reductions in support for bus services. Between 2011/12 and 2016/17, rural bus mileage fell by over 6%. During this period, patronage on supported bus services in non-metropolitan areas of England fell by more than 30% and in Wales by 44%

The Association of Public Transport Co-ordinating Officers (ATCO) reports that the support per head of population for local bus services in Britain outwith London (which is regulated differently) fell by 29% between 2008 and 2018. (ATCO, 2018) The stark reality of both the CBT and ATCO surveys, but concealed in the averages, is that the loss of services was disproportionately concentrated in rural areas. There are several counties in England now totally bereft of conventional rural bus services; the devolved administrations in Scotland and Wales have been more successful in ensuring that basic levels of service have been maintained, although they are not immune from cuts.

Delivering accessible and high-quality services to rural communities is challenging for service-providers, given the scattered settlement pattern. They may face lost economies of scale, high infrastructure costs, extra travel time and additional delivery costs.

Ministers in successive governments of both major UK parties have often advocated community transport and demand-responsive transport (DRT) as solutions to the need for public transport in rural communities. However, for community transport, the economics only work because their drivers are volunteers or on low wages, and many of their vehicles are funded by capital grants or charitable donations. This formula worked for many years, until a legal challenge led to community transport operators having to comply with onerous licensing conditions, cutting off access to contract work that supported otherwise unsustainable operations. In the case of DRT, even if the smaller buses used are cheaper to buy and run, the driver is unlikely to work for a smaller wage than his or her colleagues, and booking, routing and communications back-office functions have to be paid for. If a human controller is employed, there will be at least two employees involved in every journey; if the back office

is automated, acquisition and licensing costs are high. Economies of scale with the back office controlling a number of different services may be possible, but this has not yet been fully tested.

Mobility-as-a-service (MaaS) offers opportunities to consider and offer a range of different transport services in a holistic, integrated way and blurs the different modes of transport. The back offices required for MaaS do many things from resource matching to set up suitable journeys – for example, DRT to train to local bus to hospital – to monitoring resource use, to distribution of revenue to different operators. This could provide a cost-effective approach to passenger transport and economies of scale might be possible.

Reduced emissions through public transport

While buses are a well-established part of society, problems of rising operating costs and declining demand and revenue continue to undermine efforts to improve services. This presents a missed opportunity. Many authorities are united in identifying the problems of mass car-dependency and the negative effects of road vehicles. However, they do not exploit the benefits of buses in addressing these objectives, such as improved air quality and health, better mobility and equality of opportunity. Instead, a decline in the number of bus-users has brought more services into the margins of viability. Whilst governments have periodically offered capital assistance to the bus industry that has resulted in the UK having a modern, low-pollution bus parc, such laudable initiatives are dissipated when those innovative vehicles perform suboptimally because much of their time is spent in congested centres, and there has been more than a decade of damage in which tax incentives for diesel cars and the freezing of the fuel tax escalator have worked against bus operators by perpetuating the spiral of decline caused by congestion and inevitably rising fares. The economics of bus operations and the regulatory framework in which they work can make it difficult to deliver what people need. There is also an image problem among potential bus-users who are not aware of the advantages that buses bring.

The bus industry has explored the use of alternative fuels on a large scale, aided over several years by funding from governments to support the introduction of new vehicles in the move away from fossil fuel dependency. Clean air has become a major health issue and using buses instead of cars will continue to be beneficial to everyone. Trials are taking place of air filters on buses that clean the air as the bus moves, an idea that could help to improve polluted environments.

Travel by car

In 2014/15, 10% of households in rural areas had no access to a car or van compared with 28% in urban areas, which highlights a greater dependence on car usage. Supporting this in the following year, in rural areas 88% of travel was made using a car (as a driver or passenger) compared with 69% in the most urban areas.

Census 2011 data relating to car or van availability allowed a simple calculation that demonstrated that rural households generally own more vehicles than urban households. This is intuitively obvious, since without a vehicle rural people can be isolated and unable to access the services, employment opportunities and activities that most people take for granted. This in turn increases the financial burden on a rural household due not only to the initial purchase of the vehicle, but also associated running costs. It highlights the implications of any policy decisions that change car ownership regulations.

A dependence on the car in rural areas is borne out of a number of issues, not least travel times. Dependence on the car is a critical issue affecting access to employment and services and therefore, policy that impacts car ownership has an implication on rural economies and livelihoods which need to be considered. This has been exacerbated by reductions in public funding for bus services. The following illustrates several explanations for the dominance of cars in rural areas:

• **Limited alternatives**: This may be a 'Catch 22': alternatives are limited because of the dominance of the car.

• **Increased regulation and reduced public funding**: Funding cuts by central government have resulted in some 30% being cut from bus service budgets after adjusting for inflation. The amount varies from 39.5% in the North West of England to 23% in the South East (Country APPG, 2020). Reductions in funding are much greater if cuts to concessionary reimbursement payments are included. The National Audit Office report states: Funding for local bus outside London has fallen. 2010 to 2019 local authority direct subsidy fell 26%, including the Bus Service Operators Grant cut was 35%. ENCTS fell 18%. Total funding in 2010 was £783m, in 2019 £512m, actual cut of 35% (National Audit Office, 2020). £783m in 2010 would be worth £1010m today, so the cut in real terms is 49%. Following a legal challenge, advice from DfT to Community Transport Operators in 2018, discouraged them from operating contracted services for local authorities unless they were prepared to do this on wholly commercial terms. This advice was followed by revised regulatory guidance for Community Transport Operators, introduced in December 2020 making the problems of securing rural services even more acute.

• **Accessibility**: Even where public transport is available it is often not easily accessible, connected or efficient. Time taken to access services and employment is greater using public transport and leaves residents in rural communities at a significant disadvantage compared to their urban counterparts. Many people have difficulty using public transport because of age and disability. This is evidenced in reports such as Buses Matter: a report by Campaign for Better Transport for the RMT (Better Transport, 2011) and The Future of Rural Bus Services in the UK by Better Transport. Issues such as lack of street lighting, poor pavements, poor staffing at stations, accessible information and poor seating and shelter bus stops make rural public transport inaccessible to disabled and older sections of rural society.

• **Generational issues**: Whilst less evidential, there are perceived generational issues. For the older generation the culture of the car is a significant pull-on people's behaviour, the car represents independence and status, which the younger generations may not similarly feel, although a lack of mobility is a significant factor behind young people moving out of rural areas.

• **Education**: The trend to more choice in education has broken down catchment area cohesion, creating more trips by private car, increasing congestion (which is a direct cost to mobility providers) and reducing the number of vehicles required to mass-transit schoolchildren. The effect of that is there is less fleet available to provide rural links at other times of the day.

Travel times

Figure 3 (see page 12) from DEFRA's 2018 report shows that people living in rural areas making the same journey by car compared with using public transport or walking had the effect of halving the average minimum journey times. Urban areas also saw a reduction in travel times when comparing travel by car with public transport or walking, but the difference was less pronounced. The average minimum travel time across all eight services examined was 37% higher in rural areas compared with urban areas overall. In 2015/16 people living in the most rural areas travelled almost twice as far per year than those in the most urban areas.

	Trips per person 2015/16	Distance travelled (miles) per person 2015/16	Travelling time (hours) per person 2014/15	Trip length (miles) 2014/15
Urban Conurbation	878	5,219	364	6.0
Urban City and Town	966	6,745	358	7.2
Rural Town and Fringe	985	8,589	382	8.9
Rural Village, Hamlet and Isolated Dwelling	984	10,159	384	10.4
England	934	6,574	365	7.2

Figure 3
Average number of trips and total distance travelled per person per year in 2015/16
(DEFRA, 2018)

This could have an impact on the policy interventions being considered. Rural and urban residents have similar travel times to their nearest food store, if travelling by car. However, if travelling by public transport or walking, rural dwellers are at a clear disadvantage, with 10% of them having to travel over 30 minutes. Options to drive and use public transport would have considerable impact on rural lives and may therefore not be as successful, unless combined with other measures – for example, the extensive use of shared private transport for journeys to school, hospital and visits to rural hubs.

Rural industry

DEFRA published its *Statistical Digest of Rural England* in November 2017. While agriculture, forestry and fishing accounted for 3.9% of local units of registered businesses in England, they are dominant sectors in rural hamlets and rural villages; in a sparse setting, more than half the registered businesses are in these industries. This sector accounts for 15.3% of local units of registered businesses in rural areas overall. Other important sectors in rural areas include professional, scientific and technical services (14.9% of businesses), wholesale and retail trade, repair of motor vehicles (13.2% of businesses) and 'construction (11.3% of businesses).

A variety of types of goods vehicles are used in rural areas, ranging from traditional HGVs and towing vehicles through to industrial farming vehicles. The growth in van use can also be seen and it is important to understand how they are used. Whether vans are being used as an alternative to a family car, movement of goods or service provision will affect the decarbonisation solution. Either way, the use of commercial vehicles is high in rural areas, and freight intensive industry is a feature of rural economies.

Farming

Farming accounts for roughly 9% of national emissions through a number of areas:

• Livestock rearing and natural processes

• Crop fertilisation using chemical fertilisers

• Materials used to build and maintain farms

• Energy use of the farm buildings and vehicles

• Transport and distribution during and after growing

• Soil-based emissions from disturbing soils

• Waste produced as a result of farming processes

Whilst this review relates principally to transport, it is worth mentioning this in context. Methane is the biggest contributor and some of the biggest wins will come from measures that help raise livestock to minimise methane emissions, such as tweaking their feed and better manure management. Farming, however, not only generates greenhouse gas, but can also store carbon dioxide through practices such as minimal tilling of the soil, planting cover crops between main cash crops and crop rotation. These can all help boost the organic
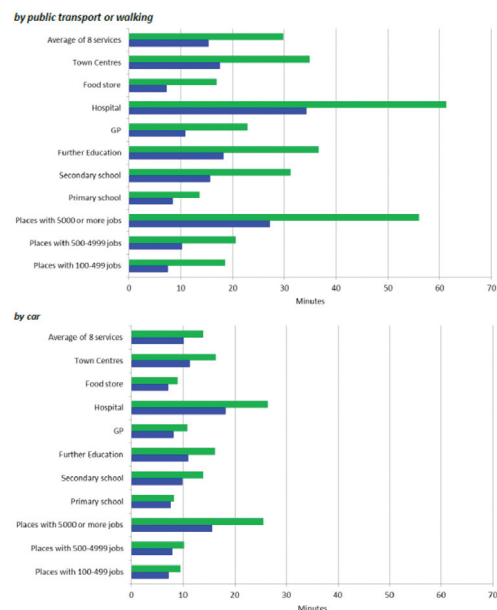

Figure 4
Average minimum travel time to reach the nearest key services by mode of travel, by Lower Super Output Area rural urban classification, in England, 2017
(DEFRA, 2018)

matter in soil so it holds more carbon. In addition, agriculture has a role to play potentially in local energy production.

Research has suggested that in high-income countries such as the UK, post-production – including storage and transport – contributes a large proportion of the food system's greenhouse gas emissions, whereas in, for example, China, fertiliser manufacture has the biggest role. (FCRN foodsource, 2020)

Farm transport is a very wide demand area, from livestock, milk collection, cultivation, crop collection, agro-chemical (including natural fertiliser) delivery and dispensing, feed delivery, horticulture, feed stock delivery for biomethane power and fuel generation.

The UK government's Road to Zero Strategy has noted that it will 'put the UK at the forefront of the global move to high efficiency agriculture' and the Paris Agreement of 2015 commits countries to revolutionising power, transport, heating and cooling, industrial processes and agriculture.

The Grand Strategy (BEIS, 2019) also prioritises supporting innovative and highly efficient precision agriculture through the Industrial Strategy Programme: Transforming food production, from farm to fork.

To decarbonise the farming community, consideration will need to be given to the balance between the industrialised farming community – bigger more energy efficient – and more natural approaches.

Transport for farms will use a variety of vehicle types and sizes, many specialised, and their use will often be constrained by weather and seasonality. Nevertheless, it is possible that some capacity may be available for the owners to participate in shared transport for the carriage of goods and people. This is discussed in more detail on

Mining and quarrying

The construction sector's main production facilities, quarries and cement plants are often located in rural areas and can be major contributors to the local economy. Some quarries are small and serve only a local market, but there is a strong trend, driven by economies of scale, to concentrate an ever greater proportion of output at a small number of super quarries serving a much wider area. Cement plants are large in scale and distribute over large distances.

Rail moves a sizeable and increasing proportion of the output of such quarries and cement works and is the preferred route to market of the construction majors, since the inherent modal advantages of rail make it highly suitable for large tonnages of bulk materials. Trains convey aggregates and cement to markets in the main urban areas and to parts of the country where, as a result of geology, there is no suitable local stone, notably East Anglia and the south-east. This involves distances as low as 25 miles (aggregates from the Peak District into Manchester) and as high as 300 miles (cement from Dunbar to Essex). The mean distance is around 100 miles, driven by large volumes of aggregate from the Mendips and Leicestershire into London and the south-east. Rail delivers approaching 50% of London's needs and over 25% of south-east consumption.

A significant proportion of these rail routes is already electrified and, given around 300 miles of electrification, virtually all longer construction materials hauls could be fully decarbonised, using renewable energy. Local movements from smaller quarries to building sites within 50 miles look likely to be undertaken by battery (or, possibly, hydrogen) powered lorries.

Tourism

Whilst not brought out in DEFRA's statistics, a key economic issue for rural areas is tourism. Undoubtedly, in many areas tourism is the dominant economic activity and has particular transport requirements, given journey distances, group (family) size, luggage, and the use of a car while on holiday. It also creates huge peaks in demand, creating emissions and frustration. Many farmers in National Parks and other high natural amenity areas have diversified into holiday accommodation and other tourist-oriented facilities, offering a potential for sharing some farm-owned vehicles for goods deliveries and passenger transport.

Public transport has a role in tourism not only as a means to getting to the tourist centre in the first place, but also with activities such as tour coaches and scenic rail tours. Currently, rural public transport provided to meet residents' needs is rarely used by tourists, who are probably unaware of it before arriving. There is the opportunity to combine local and tourist needs, and for the responsible authorities and operators to join with tourist boards and others promoting tourist activity to publicise opportunities for leaving the car at base during their stay. Good examples of services promoted for leisure use are to be found in Cumbria, the Yorkshire Dales, the North Yorkshire Moors and the Gower Peninsula. Roads generally have less of a sustained road congestion problem compared with urban areas and the strategic highway network, although the traditional Bank Holiday traffic jams on the M5 and A303 are, of course, related to tourist demand. Movements of large agricultural or quarrying vehicles may also cause significant traffic build ups and delays on the often narrow, winding rural roads whilst urban style congestion frequently occurs, if only briefly, in the most popular market towns and rural villages.

An interesting public transport initiative initially for ramblers that is also meeting some local travel needs

(that could potentially be replicated) is Dalesbus. (Dalesbus, 2020) This was established as a result of objections to withdrawal of sunday bus services into the Yorkshire Dales National Park from ramblers living largely in West Yorkshire and Lancashire who, backed by the Park Authority and others. including West Yorkshire Passenger Transport Authority, offered to show they could deliver better services within the previous local authority support payments. The Dales & Bowland Community Interest Company (D&B CIC) was established in 2007 and procures each year a network of primarily sunday and bank holiday services, some of which now operate in winter as well as summer. The business model is an interesting example of the principle 'the beneficiary should contribute', although some public support finds its way directly or indirectly into the coffers and initially was in the majority.

Examples of 'the beneficiary paying' include the National Trust at several properties supporting Dalesbus rather than expanding their car parks, the operators of the Settle–Carlisle Railway demonstrating its commitment to integrated transport by a direct grant and coordination with Dalesbus services at several stations along the line. Each year, D&B CIC approaches existing and potential beneficiaries and sponsors, and, despite predictions each year of an imminent demise because of economic conditions, has actually expanded the network of services year on year. Similar networks (possibly not quite so successful) have been developed mainly in National Parks and Areas of Outstanding Natural Beauty.

Covid-19 succeeded to some extent in curtailing Dalesbus and other tourist services throughout the UK in 2020. Even so, Dalesbus is still operating, albeit with some reductions to its original plans.

Another interesting approach has developed informally along the North Norfolk coast. A commercial Coasthopper bus service operates serving both local and tourist markets during the working day. The coast roads have many popular restaurants and gastropubs, and on the last Coasthopper services of the day part-time workers travel outwards for their evening shifts. Many of these are students and senior school pupils and groups of establishments have combined to return their young part-timers home in minibuses or shared taxis. This is another 'beneficiary pays' model that appears capable of replication.

Lastly, parking (for cars and coaches) is an issue in many rural villages and small towns not only in terms of volume, but also because of the spoiling of locations by street parking.

Tourism-related transport also needs to consider cycling and walking. Guided walks and cycle (increasingly electric bike) hire businesses have been established in National Parks and surrounding areas, some by farmers diversifying their interests. It not clear whether off-road cycling and walking comes under a transport heading, although motor vehicles may well have been used to access the activity.

There is an aviation-related element, which is that air services are vital to the tourist industries of islands (Channel Islands, Isle of Man, Scottish Islands) and probably Northern Ireland (although there are ferries), but probably less so for mainland UK locations, where there is road and maybe rail access.

Homeworking

Covid-19 has perhaps speeded up the move towards the acceptability of working from home on a much larger scale. Statistics from the Office for National Statistics (ONS) showed that, in 2015, 4.2 million people across a range of sectors worked from home. In April 2020, ONS statistics showed 49.2% of adults in employment were working from home. Whilst the numbers may not remain as high, suggestions are that businesses are looking to see how homeworking could become a much more common option in the future. This could have implications for rural communities and transport. It could mean that not only will commuting requirements be reduced and therefore the need to be close to buses and trains may not be as important, but also the demand for online services (as well as broadband) increases as people become increasingly able to work and shop online. It may also change the way in which people consider their living spaces – for example, the need to live in urban areas, close to work may no longer be a driving force and therefore the option to live in more isolated areas could increase, placing more demand on local transport infrastructure.

The surge in on-line retail market shares has been remarkable during the pandemic, as people have worked from home and been unable or unwilling to visit town centres. Vans were already the main growth area in traffic – expanding much faster than the economy at 2.8% for large vans, 5.3% for medium vans and 6.1% for small vans. The full scope of van activity, especially in rural areas, is an important research gap in the context of decarbonisation strategies combined with the imperative to reduce rural deprivation. Electric vans will be appropriate in the longer term, but longer journey distances, a lack of charging and consequential range anxiety may impact effectiveness. And rural van activity is notably less productive in drops per hour than the urban context. Some consolidation of journeys (at both origin and destination via Mobility Hubs (see page 23)) and the creation of combined bus-freight models offers potential to resolve both freight and accessibility issues.

March 2020 saw 21% rise in online shopping compared to 2019. E-commerce supplied 27.5% of total retail sales in 2020. Without the likely effect of the TCA and Covid on the economy, this trend may have been expected to be 33% by 2024 but the trend is unlikely to continue.

The very steep increase in e-commerce before Christmas 2020 spawned a plethora of home delivery sub-contractors in privately registered vans and cars. Post inoculation return to freedom of movement may reverse this trend to some degree and in turn revitalise retail rural and urban retail centres, be it based on different supply logistics models. Further research is needed in this area to understand the implications potential changes to shopping modes or a return to traditional options.

An important lifestyle trend in larger urban areas is for prosperous young households to enjoy urban living until children come along. The families then want a more spacious, ideally tranquil setting. They may move to villages and whilst many will walk, cycle or park and ride at a railway station, many will not or cannot. Thus, commuting trips may become car borne (Dargay, 2002), with a double impact in the urban area with walk, cycle or bus trips replaced by a car commute. This phenomenon may be termed the 'urban halo' and can easily result in more than 40km daily commuting distance per day. (Champion, 2009) Observation suggests that this behaviour has also resulted in generations of young people who experience public transport only as the school bus, depending on parental 'taxi services' for their non-school activities.

Anecdotal evidence, consistent with research on car ownership and area of residence (Statista, 2015) suggests that many 'urban halo' households have multiple vehicles, perhaps one for each parent and one for each adult offspring able to drive. This may be confirmed by the 2021 Census.

Digital connectivity

Digital connectivity is one service area where there is clearly improving service provision in rural areas, as fixed broadband and mobile networks are extended. Nonetheless, they are not yet available to all rural residents or businesses. Mobile network provision lags behind urban areas.

Where broadband and speed information are available, the average broadband speeds in the majority of rural area types are lower than speeds in urban areas. In 2014, the average broadband speed in rural hamlets and isolated dwellings in a sparse setting was 5Mbps compared with 27Mbps in major urban conurbations. This may hinder app or cloud-based solutions to decarbonisation – for example, DRT or high-tech farming solutions requiring good internet connectivity.

In its report: *Unlocking the digital potential of rural areas*, Rural England Community Interest Company and Scotland's Rural College stated that across the UK, it could add between £12 billion and £26 billion (gross value added) annually to the UK economy, and this would result from the additional turnover achieved by rural-based businesses, which would be between £15 billion and £34 billion annually. It also showed that productivity growth (more than £9 billion of the £12 billion) would come from microbusinesses that have between zero and nine employees.

The report suggested that the main potential from increased digital adoption in rural areas would come from assisting the bulk of ordinary small and microbusinesses to raise their digital game. Whilst technology-driven businesses should not be overlooked, it is growing digital adoption across sectors such as agriculture, retail, tourism, construction, leisure and business services that will pay the highest productivity dividend.

The digital appetite of rural businesses is illustrated by the fact that four in five of them believe digital tools and services will be important to their future growth. Cloud computing is seen as important by 67%, 5G mobile by 54%, the Internet of Things by 47% and machine learning/artificial intelligence by 26%.

It is equally notable that over 80% of rural businesses that exported in the last year made use of online sales. The top export destinations were the EU (84% of exporters) and the USA (45%). (Rural England, 2018)

The impact on decarbonisation from unlocking this potential could be twofold. Increasing activity in rural areas may increase transport needs, which may help drive efficiencies, but could put more pressure on local transport networks. However, the digital phenomena could enable more sharing of resources, procurement and transport, allowing rural economies to grow better.

In many rural areas, except around large villages and internet-connected schools (which have been prioritised by local authorities), neither 4G phone coverage nor public Wi-Fi services are available. Some 95% UK 4G coverage is promised by 2025. (OfCom, 2019)

Future transport trends

The Campaign for Better Transport has considered how future transport trends will impact the rural community. Transport Focus identified a number of characteristics of the future of travel:

Younger people will continue to be drawn to cities, where housing will be more affordable and there are opportunities to integrate activities and socialise. Transport is likely to be more collaborative, customised and based on shared ownership. However, rural areas are likely to continue to have older populations. There is unlikely to be a critical mass to support collaborative models of transport and so it is likely that these areas will retain a dependence on car ownership. However, there is a strong case for developing what could be thought of as social MaaS, where public authorities and other stakeholders assess the potential for collaborative services, including lift-giving and car clubs, building an inventory of the many vehicles potentially available for this – for example, taxis, hire cars, employee and school transport vehicles, non-emergency health transport, community transport, buses and trains, car clubs and non-commercial car sharing/lift giving – and develop cost and revenue allocation models to sit in a back office, the running costs of which can potentially be shared across several areas to spread the overhead of the high-performance computing and cloud storage required. In principle, there is no reason why the back offices should not offer goods and parcel collaborative ventures, as well.

Characteristic	Outcome
Customised and flowing experience	More bespoke and individualised information and services; easy to find out about and to use
Collaborative travel	Users work with providers; peer to peer advice and assistance; incentives and rewards
Useful mobility	Public transport infrastructure and journeys valuable for productive activity
Going local	More frequent local journeys; transport hubs more integrated with surroundings
Considered and constrained travellers	Fewer and shorter journeys, possibly more suited to public transport
Public transport as app	Technology an ally with transport (information, on demand, feedback)
Emotional journeys	Pre-journey as important as journey, ensuring people's moods are safeguarded
Public and private transport mash up	Journeys not modes; less 'ownership' of transport; mix of private and public transport; spectrum of options with seamless transfer

Figure 5
Future transport trends
(Transport Focus)

Low-carbon vehicles

Currently, the most viable low-carbon vehicle is considered to be battery-electric, and therefore this section focuses mainly on that route to low-emission vehicles. At the moment, the main alternative to achieve zero emissions is hydrogen power, but while it is likely to play, a role at the moment, its overall energy efficiency is poorer than battery-electric. Stakeholders were at pains to note that diesel has an important interim role to play, especially in rural areas and the ongoing development of Euro standards will continue to improve diesel emissions performance.

Electric vehicles are already practicable (albeit with high initial costs) for cars, light goods vehicles (LGVs), and for some light agricultural machinery. There is more of a challenge for Heavy Goods Vehicles (HGVs) or heavy agricultural equipment. For HGVs in particular, it is currently difficult to see how long-distance HGVs could be powered by battery or hydrogen without frequent fuelling stops and some impact on payload. Therefore, the timing and ultimate solution for transformation to alternatively fuelled vehicles will depend largely on average journey distance and average payloads for HGVs serving rural areas.

It is worth noting that progress is being made towards electric vehicle solutions for the HGV market, especially in the USA, and trials and prototypes are being progressed in the UK. The barriers of technology, payload and range mean that achieving the goals of the Road to Zero carbon in a timely way may be challenging.

There is evidence to suggest that the barriers to electric vehicles can be overcome with the right policy interventions to encourage further research and development. In the interim, and for some specialised uses such as agricultural equipment, other strategies, such as biofuels and, later, hydrogen may become more effective.

The need for other non-electric strategies is supported by the responses to the OLEV 2035 consultation on phasing out petrol, diesel and hybrid cars and vans by 2035, in particular the IMechE and Partners Response, which stated: 'Requiring all new cars and vans to be electric only by 2035 is a very high-risk strategy, as it requires several challenges to be simultaneously addressed, such as infrastructure, costs, weight, recycling and resource availability. The dual approach reduces risk, can be customised for different consumers and can be implemented in phases. It will stimulate the supply of low-carbon sustainable fuels for both new hybrid vehicles and the existing fleet as well as scaling up the industry for other sectors such as heavy-duty vehicles, aviation and marine.' (Institution of Mechanical Engineers, 2020)

Positive attributes for transport decarbonisation

In assessing the viability of electric vehicles, there a number of features of rural life that may lend themselves to their use.

Even in more economically challenged areas, people are more likely to have off-street parking and therefore be more able to have charging facilities than their urban counterparts. Householders in rural areas often have two cars – one long-range vehicle and one for shorter journeys, opening up the viability of electric vehicles.

Farms are important business hubs in their own right, sometimes with good access to power supplies that could be used to charge machinery and HGVs overnight. However, access to high-capacity power supplies could be a major constraint in other locations, even if overnight charging demand is mitigated by smart charging technology.

There is great potential for rural areas to have to have more localised power generation – for example, farms producing energy, such as biodiesel or wind/solar power.

Savings made on vehicle running costs through lower fuel costs and less maintenance will be of greater benefit in rural areas due to the higher mileages being driven. However, whilst rural areas do have longer journeys to key services, these increases are not by hundreds of miles but rather only a few extra miles per average journey – see Figure 3 (page 12).

Challenges for transport decarbonisation

It is also clear that the rural environment has conditions that may make electric vehicle use more challenging.

Electric van use in rural areas may well be more challenged by higher payloads than elsewhere and possibly by longer daily mileage (although data on this is not available). This could be addressed by changes to the way that vans are used – for example, with more hub-and-spoke operation. This could lead to the development of rural mini hubs acting as local service providers for first and last mile deliveries by electric vehicle.

Policy needs to consider how MaaS[1]/Delivery-as-a-Service (DaaS) can be used as a potential alternative transport provider for rural society, rather than simply replacing carbon-intense vehicles with electric. The extent of cycling (pedal and electric) in the rural fringe in place of conventional vehicles already in play and should be part of the policy mix.

Agricultural equipment is outside the scope of the prohibition of internal combustion engine light vehicles sales and of the 2040 date for the electrification of new HGVs. However, the issue of agricultural transport and equipment needs also to be considered in the long-term approach to rural decarbonisation.

There is a trend towards increasingly powerful agricultural machines to deliver greater productivity. However, alternatives solutions are being developed, particularly in South-East Asia where small automated robots are being used (electric-powered rough-terrain toolbars under GPS guidance), reversing the trend towards larger fields and eliminating diesel power. This could create an opportunity for locally produced electricity to fuel small farming equipment, clearly a local and potentially more sustainable supply chain. Autonomous smaller electric agricultural equipment is already available in the UK.

The economic and societal cost of a wholesale change in UK agricultural practice by 2050 is outside the scope of this paper, but should not be neglected in mid-horizon rural planning strategy.

Impact of Covid-19

Whilst the impact of Covid-19 is evolving, some short-term changes are likely to become the new normal. An important example is home shopping and e-commerce. This provides an opportunity for rural communities not -only in terms of access to retail, but also for small-scale rural businesses to reach their customers.

As discussed on page 15, it is also true that delivery to remote areas is challenging, possibly more so if deliveries are to be zero carbon. There is a risk that these challenges could be passed on to rural customers either through higher costs or poorer service quality. Decarbonisation needs to address ways to improve efficient deliveries to rural areas, possibly through hub-and-spoke operations, or through franchised last mile delivery services focused on particular areas.

Local convenience stores in particular have grown in popularity, with data from Kantar showing independents and symbol stores growing their market share by 40% in the 12 weeks to 19th April 2020.

Convenience has always underpinned consumer shopping habits and this has not changed, with the potential for more people to work from home, which may reduce as we come out of lockdown, but is likely to be greater than pre-Covid-19 days. This will drive footfall for convenience shopping.

Social distancing measures are likely to remain for some time, and therefore the shopping experience may well be very different and will likely drive more online or more local shopping to avoid large regional shopping destinations. The desire to avoid large shopping areas during lockdown meant many local independent stores were able to maintain trading as they quickly adapted to social distancing measures, embraced social media and offered home deliveries. Now that customers have seen the benefits of independent shopping, it is likely that some of this will remain as consumers to re-evaluate their shopping behaviour.

As consumer confidence grows, footfall in regional centres and shopping malls will start to increase. However, there remains a huge opportunity for local retailers to build on the relationships they have formed with local consumers during lockdown, capitalise on more thoughtful and mindful consumers and provide a convenient, streamlined and pleasant shopping experience. This could have a positive impact on the travel behaviours and dependency on the car in rural areas.

1. Mobility-as-a-Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride, car or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. For its users, MaaS should be the best value proposition, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys, as well as the entire system of mobility services.

A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages for transport operators including access to improved user and demand information and new opportunities to serve unmet demand. The aim of MaaS is to provide an alternative to the use of the private car that may be as convenient, more sustainable, help to reduce congestion and constraints in transport capacity, and can be even cheaper. (MaaS Alliance, n.d.)

THE LOGISTICS NEEDS OF RURAL INDUSTRY

The paper now considers how freight and logistics need to feature in a low-carbon rural setting.

Rural freight transport

Rural freight transport is provided by a wide range of service providers, including national third-party logistics providers from regional distribution centres (RDCs), national courier and parcel carrier services (the integrators such as FedEx and UPS) often supporting local carriers through sub-hubs, and local farm transport handling food directly from suppliers to local vendor centres. In many locations, farms have developed road haulage businesses, some of which have become quite large.

While many deliveries to largescale farms are full loads, it is not unusual for large articulated vehicles to thread through narrow lanes to deliver a single pallet of fertiliser or building materials. HGVs collect dairy produce from a network of farms, and export crops such as grain and sugar beet during the harvest seasons.

While farmers and their suppliers have historically used tractors and trailers to move materials over short distances, more recently high-payload, high-speed, tractors have increasingly been used as an alternative to contracted road haulage to transport crops and materials over short to medium distances.

The effect of evolving demographics and rapid growth of e-commerce, and the increase in residential accommodation in villages requires a re-evaluation of the role of the rural road network.

It is likely that retail logistics evolution focusing on lower emissions, coupled with trends towards active travel, will reduce the demand for shopping trips to urban centres. 'Unpackaged' local produce centres with local e-commerce networks offering direct rural deliveries are already in play, stimulated by the Covid-19 lockdown.

DaaS in parallel with MaaS, possibly employing the same low-emission vehicles and service providers serving the same rural customers, will generate a pattern of rural sub-hub cross-dock distribution centres, possibly based in converted farm premises. This is already evidenced on the metropolitan-rural fringe such as in Kent for e-commerce distribution.

A key challenge is to maintain accessibility while recognising that many rural roads are not suitable for heavy goods vehicles or buses. Many farm vehicles are larger than traditional HGVs, but they are manoeuvrable. Major farms in themselves are likely to become rural hubs as the effects of the post Brexit Agriculture Bill become evident – including potentially a 40% loss of income or subsidy, and a totally different attitude to land use. This agrarian reorganisation should be hand-in hand with rural infrastructure planning such that a hierarchy of major feeder roads together with the development rather than elimination of the existing network of rural bridleways (many light vehicle accessible) and footpaths/cycle ways are exploited.

Service to communities on smaller roads, not suitable for HGVs, could be improved by using rural hubs with final delivery by smaller, zero emission, vehicles.

It may not be affordable or practical to provide public transport services for all rural dwellers. To keep the car section of a trip as short as possible, park and ride sites which may only need to be small should be created on strategic bus routes (car feeders to main routes are part of the mix, ideally for shared use) providing fast direct services to local and regional centres, possibly at rural logistics hubs.

Rail freight: an opportunity for remoter rural communities

Distribution of consumer goods into rural areas is expensive because of low population density and thus low demand. This is exacerbated in remote areas by distance from RDCs, which can sometimes be greater than the trunk haul from national distribution centres (NDCs) to the RDCs. In such circumstances, there is a long-stem haul to get to the area even before the vehicle starts its drops.

Producers in rural areas, notably agriculture, mineral extraction and forestry, but also industry based on farms, face high transport costs to deliver goods to customers. The cost of bringing in raw materials from suppliers is similarly high.

More remote areas will face challenges to decarbonise deliveries, and this may lead to increased costs. Rail freight offers a solution that is not significantly impacted by changes in road haulage costs and with much lower carbon emissions, which could potentially be reduced to zero carbon emissions.

Rail freight already plays an important role in some rural areas, including:

- Movement of high volumes of aggregates from quarries in the Peak District and Mendips, avoiding hundreds of thousands of truck trips on rural roads

- Movement of supermarket goods from RDCs to the Highlands of Scotland

There are at least two ways in which rail freight could potentially play a greater role:

- Trunking of products and goods between NDCs and rural logistics hubs, which would allow final delivery to be made using battery-electric vehicles

- Innovative intermodal solutions combining rail haulage and last mile delivery by electric vehicle

Rail trunking

Currently, for retail goods rail freight is mainly active on very busy corridors, such as the Midlands to Scotland. Other trunk routes include the Midlands to Teesside, London and Bristol. One current limitation is that rail freight is only used when one single retailer can guarantee a base load of most of a daily train between two points, ideally filled in both directions. Generally, major retailers do not share trains. Sharing trains might make secondary trunking routes viable such as to North Wales, the south-west, East Anglia or parts of Scotland.

In addition, there are still major rural industries or clusters of industries that do not currently use rail, but that could do so via a rail freight hub. A very good example is the huge food industry concentration around Spalding.

Innovative rail solutions

An example of how intermodal could work is the Highlands in Scotland. One feature of the Highlands is that most communities of any consequence are located on the rail routes and retail stores are in most cases close to a passenger station. This suggests that, if a suitable logistics system could be created, a rail operation could deliver goods close – in some cases very close – to stores. Further, given low passenger volumes and stops for operating purposes, such as pathing en route (as well as recharging, in the future), it may be possible to operate a proportion of passenger trains as combined passenger and freight services. This would involve slightly extended stops at certain stations for roll cages to be offloaded. Local battery trucks could be used to convey goods from the station to stores.

Zero-emission rail freight

Zero-emission rail freight has existed for over 100 years – for example, the electrified Gotthard Railway in Switzerland, opened in 1916–20 and is powered by hydroelectricity. Many rail freight corridors in the UK are already electrified, including the key national corridor, the West Coast Main Line. Network Rail and the DfT are developing a plan to extend electrification of main lines significantly, including some corridors with high volumes of rail freight.

However, on the very lightly trafficked lines in deep rural areas, electrification may be difficult to justify, and other sources of power – most probably battery – seem to be the way forward.

For bulk products, a large battery-powered locomotive is likely to be the best option. Calculations suggest that such a locomotive, equipped with regenerative braking to recharge the batteries whilst going downhill, could haul a load of over 1,000t, stopping to recharge batteries fully from lineside source every

40–50 miles. Many deep rural routes are single track and freight trains usually have to wait in loops to pass oncoming trains, so this time could be used for recharging without incurring undue delay. Range could be extended by attaching a battery tender to the locomotive, effectively a wagon carrying batteries.

Alternatively, for lighter loads it appears that the battery power required for an electric-powered passenger coach could also power a freight vehicle capable of conveying a 12–15t payload, with the same en route recharging requirements, and capable of operating in multiple with the passenger stock. An option could be a flat-bed vehicle on to which a swap body that originated at the RDC could be conveyed without intermediate handling of the goods. Another option would be for roll cages to be loaded into a passenger-type vehicle through the sliding doors.

The intermodal option of a flat-bed vehicle on to which a swap body could be loaded has advantages in reduced handling cost, greater security and maintaining temperature control for chilled and frozen foods. Given the relatively high deck needed to allow for the power train and the restricted gauge clearance of most of the Highland lines, a fairly low-profile swap body would be required.

This need not be a showstopper, since store delivery of roll cages needs a floor-to-roof clearance of only around 2m. Such units would have to be specially constructed as this is a not an off-the-shelf configuration, but it would appear feasible to use a swap body of 15.5m length, which would maximise payload. The unit would need side access (curtain or sliding door) for unloading at stations. Transferring the swap body between a trunk intermodal service from the Central Belt to a Far North or Kyle service at J G Russell's facility at Inverness Needlefield Yard would be straightforward.

Use of a repurposed passenger vehicle to convey roll cages would be more straightforward and, probably, cheaper at first cost, albeit with greater operating cost, as roll cages would have to cross docked individually from the trunk swap body to the local train – a labour-intensive activity. Conceivably, where volumes are very low, such as to Mallaig, a section of a passenger-carrying vehicle could be locked off and roll cages loaded in this space. To preserve passenger capacity on busy services, tip-up or retractable seats (such a system will shortly be available) could be used in this section.

An intermediate option would involve the use of small containers, 15–20ft long, which could be loaded in groups – effectively as one large container – at the DC. They could also be transferred as a group from the trunk train to the local service at Inverness, using the same reach stacker as large containers, but unloaded individually en route using a large fork lift. When unloaded, each small container would be placed on a van or small lorry chassis, battery powered, for final delivery to stores or home delivery.

Rural air transport

Some regional air services are to remote regions, such as the Scottish Highlands and Islands, and there is also limited but vital air freight to such places.

The economics of regional air services are particularly fragile, although helpfully flights from the Scottish Highlands and Islands and Channel Islands do not attract Air Passenger Duty on departures.

Competition is particularly relevant for air services within mainland UK, from both rail and road.

There are a few airports serving predominantly rural regions, such as the Scottish Highlands and Islands and Newquay, but often an airport serving an urban area also serves the surrounding rural areas, and in many cases may be sufficiently outside the urban area to be accessible to many rural locations. In some cases, it may even be easier to access the rural location than the city centre – for example, Bristol, Leeds Bradford.

The environmental effects of aviation on rural areas are limited because of the dispersal of flight paths and the relatively small numbers of flights at the smaller airports. However, one issue that is relevant is that tranquillity can be easily disturbed by even a single event.

Electric-powered drones are already being used to deliver urgent packages to remote Scottish islands. It would be possible to see such services extended, improving service quality and reducing emissions compared to sending a van or motorbike.

Whilst drones are considered niche there could be applications; as an example, there has been a successful trial of drones used for NHS deliveries on the Scottish isles, and this could be used in remote or hard-to-reach areas. There are other examples in Europe and whilst it may never be a widespread solution for mass freight it could provide a complementary service. (The Guardian, 2020)

Coastal and inland waterways

There is a role for inland waterways/rivers for freight transport to rural hubs previously engaged in agricultural and forestry transhipment to reduce emissions. This review acknowledges that more research is required in this area.

GOVERNMENT LEVERS

Taxation is a major element of transport costs and can be used to affect the amount and timing of travel, and carbon emissions.

This section aims to:

• Comment on the key relevant policies identified in the Road to Zero strategy that have relevance to the rural environment

• Provide some additional commentary on the key decarbonisation levers currently being proposed

• This should be read in combination with CILT's *Route to Net Zero Year End Report Summary*

Local energy supply

Inherent in the proposal to ban the sales of internal-combustion-powered cars, vans and HGVs by 2040 is the need for sustainable electric power generation and distribution.

Solar and wind farms are already part of the agriculture industry business, the income from their contribution to the National Grid outweighing that of food production. Power generation and the manufacture of biofuel from herbaceous digesters are also important zero-carbon industries in rural areas.

The rationalisation of dispersed rural centres into rural economic hubs offers opportunities for agricultural business to sell power into the community, farms becoming sustainable power stations and communications centres for their own and community use. There needs to be discussion at central, devolved and local government levels to incentivise and manage the required structural change necessary to balance land use for food and power production against employment opportunities and rural society.

Infrastructure provision

If battery-electric vehicles are likely to be the main pathway to achieving zero carbon emissions, then consideration needs to be given to how this will be supported in rural areas. Many rural homes and villages should be able to accommodate overnight charging for family cars or light vans. Some businesses will already benefit from strengthened electrical power supplies to suit their non-transport needs. However, some rural businesses may not have adequate power supplies to charge fleets of HGVs, agricultural equipment, or LGVs. These locations must be identified and a strategy to address shortcomings developed. This could include encourage a link to local power generation.

Furthermore, to enable car and freight movements into rural areas, widespread provision of charging points in rural areas must be accelerated, noting that distances covered for single trips may be much longer than in urban areas.

CILT has long advocated that a national system for road-user charging should be adopted. Indeed, the Treasury needs to replace the income from road fuels by an alternative as electrification of transport proceeds. In the past at times of disruption in fuel supplies, relief in the form of reduced taxation on fuel at the pump has been given in remote areas, such as the Scottish Highlands, and businesses in such areas get business rates relief.

In devising a road-user charging system for vehicles not powered by petroleum fuels, the government

needs to consider whether reduced or tapered charging rates should be levied in rural areas to compensate for the longer distances involved. It is worth noting that Scottish Ferries now charges a Road Equivalent Tariff with relief for island residents.

Economic hubs/Mobility hubs

There is also considerable evidence of services benefiting from sharing premises and co-locating with each other at hubs, which may enable them to achieve some cost savings and generate more footfall. This could mean the consolidation of people and goods. This could also enable the move to electric vehicle by reducing the mileage to the end destination. However, this needs to be reflected in planning guidance and funding to encourage their development and use.

For example, a hub could include retail businesses, a cluster of work spaces, a bus station for transfer between inter-hub buses and local last mile services, a home-shopping collection point and a rural consolidation centre receiving loads in HGVs for final delivery in electric LGVs.

Midlands Connect is looking at providing guidance for local authorities on building community hubs (tools, decision points, technical and economic factors). The provision of a clear framework and menu of options for local bodies to consider could become the key to supporting sustainable and economic local solutions.

If these hubs are collocated with mobility hubs there is clear potential for bus/DRT/MaaS services to be used for last mile/first mile goods transport.

The hubs could eliminate the need for multiple different delivery companies to serve every village and every road, with deliveries being made in a zero-emission vehicle, designed for local conditions, and delivered by a local person.

These hubs have the potential to expand the "working from home" potential with creation of local work centres in rural areas with fast broadband etc for those for whom home working is technically possible but is limited by poor services or space. Consolidating 'home working' in rural centres would overcome the problem of isolation which sometimes accompanies working from home.

Aside from hubs the opportunity for multipurpose centres, such as supporting the return of village shops and more innovative ways of combining village services and facilities (for example a pub that is also a shop and a post office) should be further developed and funded. An example is in the Snowdonia National Park where there is a park and ride at petrol stations out of town. Community Interest Companies (CICs) could be the delivery route for such enterprises.

Passenger transport

The opportunities that MaaS provides could support the Road to Zero ambition. The preference in allocation of passengers to low-carbon vehicles could be given by back offices, although there are equity considerations that need to be tackled if this approach is adopted. A clear lead needs to be provided through the provision of a framework for local authorities to work within. Without this there is a risk of creating pools of activity that lack sufficient integration into the wider initiative.

Car sharing would need to be part of the solution. However, it would also be important to ensure that there was a credible inter-urban bus network supplemented by DRT services.

It should be noted, that whilst electric vehicles may provide solutions to decarbonisation for passenger traffic, they do not offer solutions to parking or congestion and therefore this area should not be neglected as part of the transition phase to a zero-carbon world.

Integrated solutions

Whilst there are a number of areas to consider, what is clear is that an integrated solution needs to be considered and this be reflected in a number of ways.

The relationship between passenger and goods transport

This is the use of private transport – for example, to schools, hospital pickups – to supplement public services, or even freight as has been successfully trialled Scotland. For many years the overnight bus from Campbeltown to Glasgow and vice versa was accompanied by a parcels service van. Much of the parcels traffic was then distributed on the local bus services in Campbeltown and along the West Coast, including the island of Ghia where the local postmaster/general store owner took over the onward delivery via the ferry (but not using Group Policy Object resources).

In rural Australia, it is common for large coaches used for the sparse passenger transport service also carrying in their underfloor luggage storage parcels and goods in a similar way to high-value goods carried in the bellies of international passenger flights.

Shared public and private services

Shared procurement of local businesses with local authority groups could not only provide financial benefits, but also create greater volume that allows for more efficient distribution. Similar to how delivery servicing plans are created for buildings, area-wide delivery plans could be created for rural areas.

Cross-sector working

Beyond the creation of shared warehousing facilities, this could suggest that collaboration between sectors could help to rebalance volumes, reduce empty running and create economies of scale. This could be facilitated though understanding freight clusters, which could help create partnerships between sectors that traditionally show no synergies.

Stakeholder engagement

Any response to the carbon challenge needs a holistic approach – energy providers, car manufacturers, consumer groups, incentives. Therefore, the stakeholder engagement (with supporting policy) is a critical success factor.

Engagement of the appropriate local interest groups and stakeholders may be the best place to start creating local solutions. Whilst quite specific, the use of community interest groups to support, for instance, community shops or pubs could have a role to play in generating sustainable solutions.

Transport and spatial planning

The National Infrastructure Commissions (NIC) report: Better Delivery, identified a key recommendation that better land use planning for freight was needed. In its context, this was in relation to the contribution freight makes to congestion. However, the same applies for the use of land as an enabler for more efficient

transport not only in terms of freight (so planning for, for example, freight hubs and rest areas), but also in terms of planning for passenger transport to allow for low-carbon options. This may for example be out of village parking and provision of park and rides for high tourist areas or the provision of spaces for charging facilities or hubs as described earlier.

In its conclusion the NIC report stated:

'*The Commission's central finding is that through the adoption of new technologies and the recognition of freight's needs in the planning system, it is possible to decarbonise road and rail freight by 2050 and manage its contribution to congestion. Achieving this requires government to outline clear, firm objectives, and begin working with the energy sector, freight industry and local areas to ensure that the infrastructure required for alternative fuels and land for efficient freight operations is available when and where it is needed.*'
(National Infrastructure Commission, 2019)

CILT's submission to the MHCLG consultation Planning for the Future in October 2020 stressed the need to cover rural issues related to house building and transport, together with the associated infrastructure needs.

Digital connectivity

As noted in this paper, if home working continues as it is and MaaS or DaaS becomes a key enabler to decarbonise transport, then digital connectivity remains a key area for focus.

CONCLUSIONS

In the same way that urban decarbonisation is not about one single solution in supporting rural communities to embark on process of decarbonisation, will require a toolkit of options that consider the unique circumstances of the rural environment.

Rural-proofing decarbonisation policies and plans is key to the recommendations of this research and rural requirements should be considered as early on as possible in the development of decarbonisation levers.

Decarbonisation of rural transport requires the collaboration of different policy areas, requiring them to consider the impact of their decisions on rural transport and therefore carbon impacts.

Equally, it will necessitate the engagement of key rural stakeholders in the same way urban stakeholders have been engaged over the last 10 years. Indeed, there are lessons to be learned on how policy has been developed that has not properly engaged with those its effects. Low emission zones and the freight sector may be an example.

In order to achieve economies of scale, the integration of people solutions with goods movements – MaaS and DaaS – could well create a synergies that enable the needs of both to be met. As well as collaboration between passenger and goods sectors, alliances between sectors could be the key to creating innovative solutions to the decarbonisation challenge.

Digital connectivity and access to information will allow for rural economic growth and is a necessity in order to achieve economic development at the same time as decarbonisation objectives.

A clear message provided by those involved in the research for this paper was that the journey to zero will be made difficult without considered communication and engagement from government and if policies do not support decarbonisation in rural environment we run the risk that people and business will simply stand still, or worse, go backwards.

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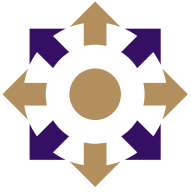
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