Population and Household Location Choice Research

Final Report

Transport Scotland

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Delivering a better world

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1.1 Introduction

In March 2022, the Cabinet Secretary for Rural Affairs and Islands announced that the Scottish Government will develop 'an action plan to address depopulation to be published in 2023'. The 'Addressing Depopulation Action Plan' (ADAP) will deliver on a commitment in the Scottish Government's National Islands Plan to 'develop an action plan to support repopulation of our rural and island communities'.

At the November 2022 meeting of the Ministerial Population Taskforce, the then Minister for Transport asked officials to assess the extent of our knowledge about the cause/effect of connectivity on population outcomes within Scotland, with a view towards informing future policy development and delivery.

Transport Analytical Services, in partnership with Population Policy, have therefore commissioned AECOM to undertake a research project to enhance the evidence base around transport and other aspects of digital connectivity, and their links to local level population and household location choice experienced at a community level across parts of Scotland.

Findings from this research will form one output to directly inform the development of the Addressing Depopulation Action Plan (ADAP), due for publication in 2023. Where possible, the research outputs will signpost towards clear actions and deliverables for areas focused on digital connectivity to deliver on, as part of the ADAP's rural and urban components.

1.2 Structure and Approach

This report will present evidence relevant to the research brief. It will aim to answer the following research questions:

1. To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses?
2. To what extent are Digital Connectivity and Physical Mobility (i.e. transport) substitutable?
3. Does this differ by activity, demographics and geography?
4. To what extent do the above variables impact on depopulation occurring within communities?
5. Can potential future access interventions consider the above variables in the context of proactively supporting attraction and retention within locations of Scotland which have experienced, or are experiencing, population decline?

The note will draw on evidence collected through a literature review, interviews with academic experts, panel surveys and qualitative fieldwork, to outline evidence in response to these questions and provide a summary of themes and recommendations.

This report has been structured to provide:

- Section 2: summary of findings from the literature review.
- Section 3: provides a summary of the fieldwork including the findings from interviews with academic experts, focus groups, and panel surveys.
- Section 4: provides a summary of themes and recommendations.

2. Literature Review

2.1 Demographic, Work Patterns and Location Choice Context

This section includes contextual information on demographic trends in rural depopulation and rural employment structures.

2.1.1 Demographic Projections

The National Records for Scotland's (NRS) mid-year population estimates highlight that for much of the ten years between 2012 and 2021 population in Scotland's remote small towns and rural areas was in decline.

In remote rural areas, NRS's Population Estimates by Urban Rural Classification, 2001-2021 showed a population decrease by 1.0% between 2011 and 2020, compared to increases of 3.1%, nationwide and 8.4% in accessible rural areas. The population of remote small towns decreased by 3.6% over the same period.

In remote rural areas, the trend changed during the COVID-19 pandemic. Between mid-2020 and mid-2021 the population in these areas increased by 1.6%. Net migration increased from 120 to 6,170 in the year to mid-2021. Growth in remote small towns remained negative, with a 0.2% population decrease in the twelve months to mid-2021.

Mid-2021 Small Area Population Estimates, Scotland also suggests populations are aging everywhere in Scotland. Between 2020 and 2021, natural population change alone would have resulted in a reduction of Scotland's population by 14,500 people. However, the population increased by 13,900 people overall, primarily driven by net international migration of 18,900 and net migration from the rest of the UK of 8,900. Population aging is more prominent in rural and islands areas. The percentage of local authority data zones in which median age increased in the previous decade varied between 55% in Dundee City and 97% in Na h-Eileanan Siar.

Demographic projections published in Copus (2018) aimed to quantify the extent of the challenge faced by remote areas in Scotland in the future. These projections focus on sparsely populate areas in Scotland, defined as areas where the population accessible within 30 minutes travel time is less than 10,000 people. It should be noted that not all remote rural areas are part of Scotland's sparsely Populated Area.

The paper notes that the population of Scotland's sparsely populated areas is in a "negative spiral of decline". Population projections developed by the study highlight that population decline in these areas could amount to 28% by 2046 against a 2011 baseline. A breakdown by sub-region is shown in Table 2-1.

Table 2-1 Projected population of the sparsely populated area and its sub-regions, Source: Copus (2018)

Sparsely Populated Area	2011	2046	% change
Northern Isles	13,430	10,860	-19%
Western Isles	13,580	9,250	-32%
NW Highlands	39,210	28,400	-28%
SE Highlands	20,600	15,510	-25%
Argyll and Bute	42,440	29,530	-30%
Southern Uplands	8,270	5,780	-30%
Total Scotland sparsely populated area	**137,540**	**99,350**	**-28%**

The decline is expected to affect age groups differentially. Working age populations are estimated to shrink by 33%. Dependent groups are projected to experience a lesser rate of decline, with the number of children reducing by 19% and over 65s reducing by 18%. This is expected to result in an increase in dependency rates from 0.6 in 2011 to 0.74 in 2046. Policies targeted at reducing depopulation and attracting in-migration need to redress this balance to target push and pull factors for the working age population.

Copus (2018) states that recovering growth in these areas would depend upon in-migration at a rate of 10 migrants per 1,000, with emphasis on people of child-bearing age to ensure longer term sustainability. These rates are currently only exhibited in Edinburgh, Midlothian, and Stirling.

2.1.2 Rural Ways of Working

Exploring the role interventions to improve connectivity can play in improving rural employment opportunity requires some understanding of rural industries and employment structures.

There are some noticeable differences in working patterns, employment and business demographics in Scotland's rural areas compared to the rest of Scotland which are explored in a Rural Scotland Key Facts 2021 report.

Figure 2-1 shows differences in the proportion of employment provided by businesses of different size by area type using the 3-fold Urban Rural Classification. The analysis is based on data from the Inter-Departmental Business Register, and as such classifies employment by business rather than employee home location.

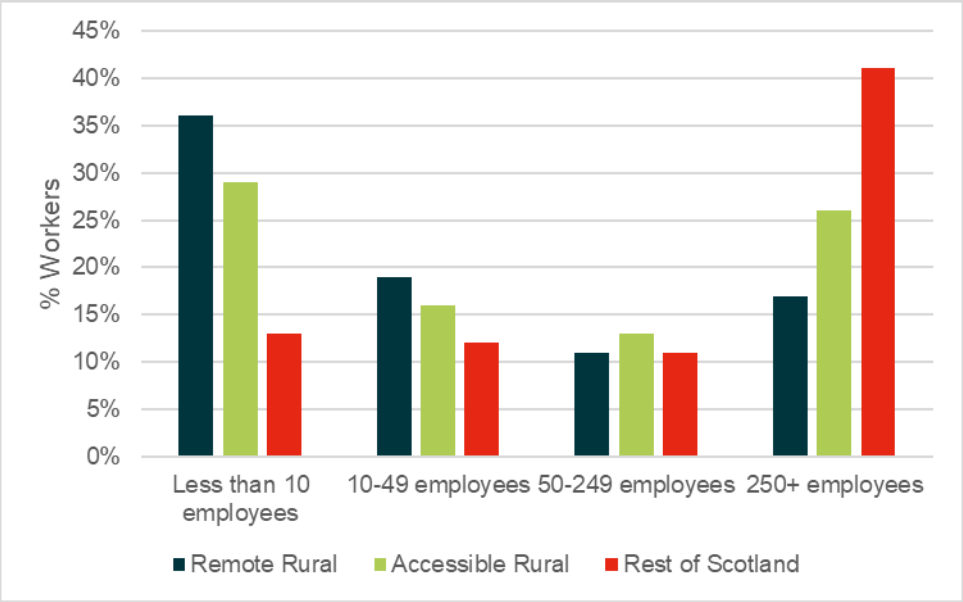

Figure 2-1: Employment by Company Size and Area Type, Source: Rural Scotland Key Facts 2021

In rural Scotland, a greater proportion of employees work in micro-businesses, which consist of between 0 and 9 employees, than in the rest of Scotland. 36% of employees in remote rural areas and 29% in accessible rural areas work in micro-businesses, compared to 13% of the rest of Scotland.

Overall Small and Medium-sized Enterprises, defined as businesses employing between 10 and 249 people, account for 66% of remote rural employment compared with 36% outside rural areas. By comparison only 17% of employees in remote rural areas and 26% in accessible rural areas work in large businesses (more than 250 employees) compared to 41% of the rest of Scotland.

As shown in Figure 2-2, the proportion of workers who are self-employed, have a second job, and work from home is also higher in remote rural areas than in other parts of Scotland. It should be noted that working from home figures are pre COVID-19.

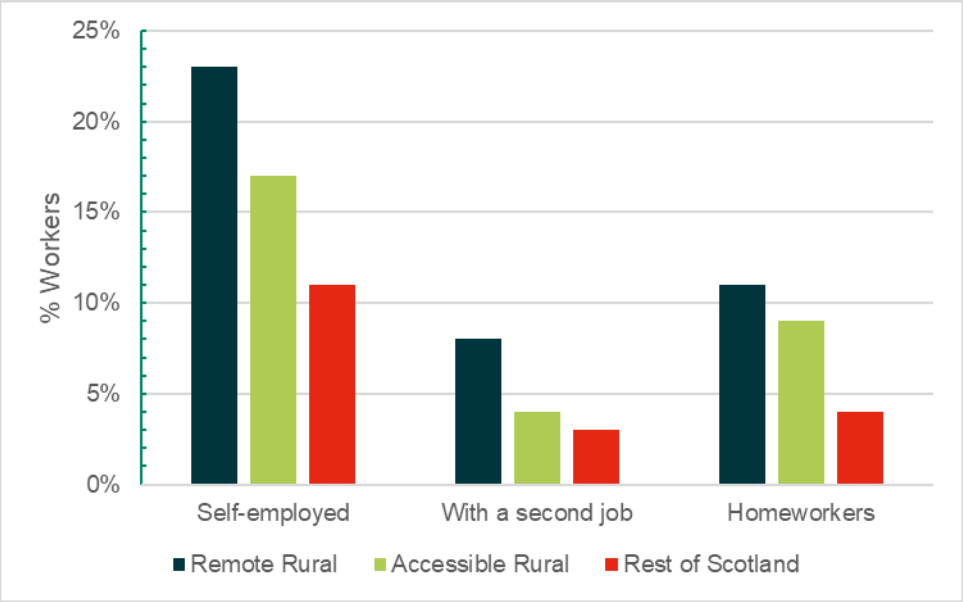

Figure 2-2: Employment Characteristics by Area Type, Source: Rural Scotland Key Facts 2021

A breakdown of rural employment by sector is shown in Table 2-2. Rural Scotland has a more diverse spread of sectors compared to the rest of Scotland, where nearly 50% of employees work in the public or financial sectors. In remote rural Scotland there are significantly larger proportions of workers in the accommodation and food services, and agriculture, forestry, and fishing sectors than accessible rural areas and the rest of Scotland. Accessible rural areas have larger percentages of people employed in construction and manufacturing than both remote rural areas and the rest of Scotland.

Table 2-2 Percentage of Workers in Employment Sectors by Area Type. Source: Rural Scotland Key Facts 2021

Employment Sector	Remote Rural	Accessible Rural	Rest of Scotland
Public	17%	17%	23%
Education, Health, and Social Work	5%	7%	10%
Financial and Other Activities	15%	17%	23%
Accommodation and Food Services	15%	9%	8%
Transport, Storage and Communication	5%	5%	7%
Wholesale, Retail and Repair	10%	12%	15%
Construction	7%	8%	5%

Manufacturing	8%	10%	7%
Mining & Quarrying, Utilities	3%	4%	2%
Agriculture, Forestry and Fishing	15%	12%	0.5%

2.1.3 Summary of Key Points

- Sparsely populated areas in Scotland are projected to see substantial population decline, with some projections indicating an overall reduction by 28% between 2011 and 2046.
- Based on NRS mid-year population estimates the population in remote rural areas decreased by 1% between mid-2011 and mid-2020. Between 2020 and 2021 population in these areas increased by 1.6%, driven by a marked increase in net-migration.
- Differential impacts by age groups are projected to result in substantially increased dependency rates. Policies aimed at creating sustainable communities will therefore need to target increased in-migration of young and working age adults and families.
- Remote rural employment patterns differ substantially from the rest of Scotland with a higher proportion of the workforce employed in micro-businesses, self-employed, holding several jobs and working from home.
- Employment by sector is more diverse than elsewhere in Scotland and employment in the accommodation and food services and agriculture, forestry and fishing sectors is more prominent.

2.2 Evidence on Research Questions

2.2.1 Household Location Choice Factors

This section introduces the factors influencing household location choice more generally and in rural Scotland. This is intended to provide context to the discussion of the role transport and digital connectivity play. A wider understanding of the choice mechanisms is particularly pertinent given the secondary nature of connectivity as a service. Transport and digital infrastructure enable access to opportunities and services and hence an understanding of how individuals prioritise wider factors is important when considering their role.

2.2.1.1 General Household Location Choice Factors

Household location choice factors can be broadly summarised as:

- Decision to move is influenced by life cycle stage, existing household tenure, and significant life course events.
- Workplace location is becoming a less prominent factor when choosing household location.

- Uncertainty whether preferences seen in COVID-19 (for greenspace and potential for home working) will persist.
- Young people are more likely to place importance on cost and accessibility to workplace in a location choice decision, whereas older people are more likely to value greenspace/countryside and neighbourhoods.

When individuals are choosing household location, Lee & Waddell (2010) suggest this can be represented as a two stage nested logit model – firstly a decision on whether to stay in the existing location or relocate, and secondly an evaluation of the alternatives relative to the previous residence. It should be noted that the respective factors relating to these stages are often referred to as push factors and pull factors in the literature.

Lee & Waddell (2010)'s study in the Puget Sound Region of Washington State, USA notes that the stage in the life of the individual will have an impact on the decision to relocate, with young adults in their twenties and thirties the most mobile section of the population. Household tenure and size are also important factors, with those in larger and owned properties much less likely to relocate. A third decision factor is significant life course events which can include starting a family, divorce, children moving away, and education and work opportunities. These factors are supported by a study by Eluru et al (2009) derived from a survey conducted in Zurich, Switzerland. The study found factors for moving home can fall into three categories: personal (changes in family circumstances), household (composition and ownership), and commute (mode and distance) related variables.

A stated preference study by Kim et al (2005) in Oxfordshire, UK, found that transport factors are important in a decision to move home, with increases in travel time to work, travel costs to work and travel costs for shopping all associated with an increased probability of moving. Other factors which influence this decision are the population density, quality of schools and the house price itself.

Turning to the location choice for the new residence, a study by Chen et al (2008) using data from the Puget Sound Region in Washington State, USA, found that previous residential location is influential in deciding which factors are most important to an individual when making a location choice decision, stating that "Households with the same set of socioeconomic and demographic characteristics could display strikingly different tastes in their residential location selection process because of the differences in prior locations". For example, this could mean where individuals have been brought up in areas with poor transport connectivity, they place less importance on this as a decision factor than those who are used to having stronger transport connectivity.

Choice of work could also be a factor for deciding residence location. However, research by Waddell et al (2006), again using data from the Puget Sound region of Washington state, USA, found that 80 per cent of workers within an urban area chose their residence first, then choose their workplace.

In the UK, Clarke (2017) found that economically driven internal migration over the previous two decades has been in decline, with fewer people changing their work location than 20 years prior. Declines in internal migration are also down to young people, graduates, and private renters moving less. In 2001, 1.8% of graduates moved employer and region, but in 2016 only 1% did. For private home renters 2.6% moved employer and region in 2001, while in 2016 this fell to 1.5%, when it is these groups who are traditionally expected to be the most mobile.

In a more recent study based on data from the Quality of Life index, Totaljobs, 2023 reported that despite high satisfaction levels with their current place of residence 65% of workers are willing to relocate to a different city. The study suggests that cost of living could be a key driver of location choice, with 74% of workers saying they are concerned about their financial situation. Young people in particular identified living costs as a location choice factor, with 29% of Zillenials considered moving to a cheaper city (compared with 18% of 35-54 year olds and 12% of over 55s). The study identified five top lifestyle considerations that would motivate workers to move, affordable living costs (36%), a good job offer or plenty of job opportunities (35%), affordable housing or rent (30%), a better work-life balance (26%) and a family-friendly area (22%).

COVID-19 has further entrenched this trend. Randstad RiseSmart UK (2020), an outplacement firm, found that in November 2020 49% of workers (the longitudinal study polled 36,000 UK adults between 2016 and 2020) said location was one of the top five factors in their choice of work and employer, up from 35% immediately pre-pandemic. Despite technology facilitating working from home, COVID-19 reversed the pre-pandemic trend which saw the above statistic decline from 40% in 2016 to 35% at the start of the pandemic. Randstad attributed this to reduced willingness to accept long commutes following the pandemic.

A UK based study by Santos (2022) found residential location choice is influenced by a number of factors which have grown in prominence since the COVID-19 pandemic. The study employed a discrete choice experimental set-up to test consumer preferences for residential locations. Locations supporting hybrid working patterns were valued most. House price and garden size were also important. However, journey distances to both work and services remained a key consideration in the location choice decision.

2.2.1.2 Variation by demographic characteristics and location

Schirmer et al (2014) undertook a review of residential location choice factors and models. The study found that households' preference for specific land use mixes varies with life stage. Young households typically favour high population density locations, whereas families and higher income households typically value low density residential population densities. Proximity to, and density of, education, services, retail and local transport facilities was valued by all. Whether proximity to road or public transport infrastructure was preferred depended on household car availability. Density of road and rail network as a source of noise and pollution was perceived as negative by all groups. Longer commutes were also valued negatively.

Thomas et al (2015) examined data from YouGov polls in cities, suburbs, and rural hinterlands in England and Wales to understand push and pull factors for location decisions through examining data describing why people choose to live where they do, and what they dislike about their current place of residence. As part of the poll, respondents were asked to state the three main reasons why they chose to live in their neighbourhood.

The study found that for the youngest age group (18-24 year olds) factors related to familiarity, including "I grew up in the neighbourhood" (28%) and "To be close to my friends/family" (26%), were the most important. Cost of housing (20%) and vicinity to place of study (17%) were also important to this group. The most common reasons among 25-34 year olds were "To be close to my friends/family" (32% of respondents), "The cost of housing" (30%) and "To be close to my workplace" (24%). For older adults (35-54 year olds) "To be close to my friends/family" (27%) took second place to the cost of housing (30%).

Reasons for choosing their neighbourhood saw a substantial shift towards factors related to the quality of the environment and housing for 55+ year olds. "To be close to countryside/green space" was the most widely noted location choice factor for people in this group (30%), followed by the size or type of housing available (29%). However, the cost of housing (28%) and "To be close to my friends/family" (27%) remained important to this age group.

Availability of public transport was of secondary importance. 8% of 18-24 year olds, 15% of 25-34 year olds, 13% of 35-54 year olds and 16% in the 55+ age group ranked this among their top three reasons for moving to their place of residence.

The study also examined how location choice factors varied by the three area types examined, city centre, suburb and hinterland. Vicinity to work, shops, leisure and entertainment and public transport all declined in importance when moving away from urban centres. Vicinity to the countryside increased.

Results from the study are presented in full in Table 2-3.

Table 2-3 Why people choose to live in their neighbourhood by age. Source: Thomas et al (2015) from 2015 YouGov poll of 2080 GB residents

Reason	18-24	25-34	35-54	55+
I grew up in the neighbourhood	28%	18%	21%	13%
To be close to my workplace	16%	24%	19%	14%
Studying in the neighbourhood	17%	3%	1%	0%
To be close to restaurants/leisure or cultural facilities	6%	9%	4%	3%

To be close to my friends/family	26%	32%	27%	27%
The cost of housing available in the neighbourhood	20%	30%	30%	28%
Availability of public transport in the neighbourhood	8%	15%	13%	16%
To be close to good schools	2%	8%	13%	8%
To be close to local shops	7%	7%	10%	12%
The safety and security of the neighbourhood	11%	9%	17%	17%
The quality of the built or natural environment of the neighbourhood	7%	8%	11%	15%
To be close to countryside/green space	7%	11%	20%	30%
The size or type of housing available in the neighbourhood	12%	14%	21%	29%

2.2.1.3 Location Choice in Rural Areas

Push and pull factors for household location choice were discussed in section 2.2.1.1. This section summarises evidence showing which of these factors are most prominent in rural migration decisions in Scotland.

In 2010, the Scottish Government (2010) published an in-depth report outlining 'Factors Influencing Rural Migration Decisions in Scotland', and how these vary by age group and life stage. The report drew on a comprehensive review of literature published on the subject since 1999.

Push, pull, stay, return factors as identified in the report for four different demographics: young people, families, people who are economically active, and older people, are listed below.

Factors relating to young people

For young people, push factors (away from rural areas) include:

- Employment – lack of job opportunities and choice.
- Higher Education – limited options.
- Housing – lack of affordable housing and high demand from older people.
- Desire for independence.
- Leisure facilities – poor availability and choice.
- Shops and services – lack of choice and growing number of closures.
- Public Transport – poor connections and high cost.
- Family pressure – expectation to start a career in an urban area.
- Perceptions – urban lifestyles more attractive and rural communities do not align with values.
- Social detachment.

For young people, pull factors (to rural areas) include:

- Local family ties or personal relationships.
- Job opportunities.
- The environment/scenery.
- Access to affordable housing.
- Perceived better quality of life in rural areas – more relaxing or outdoor activities available.
- Revived interest in Gaelic language and culture.

For young people, stay factors include:

- Securing a good job locally.
- Local family connections.
- Appreciation of high quality natural environment.
- Sense of attachment to rural area – through social or hereditary links.
- Ambition to start a family over academic or career ambitions.
- Strong sense of community.
- Parental expectations and ambitions.

For young people, return factors include:

- Access to appropriate jobs and vocational training.

- Affinity with local area – own identity is tied with that of the area, ability to identify with other people from area.
- Good contact with people and organisations in area.
- Social and family ties – including caring responsibilities.
- Perception that improvements have been made to local facilities and services.
- Lack of affordable housing in urban areas.
- Revival of the Gaelic language and culture.
- Appreciation of the rural lifestyle.

Factors relating to families

For families, push factors (away from rural areas) include:

- Housing – shortage of affordable larger housing.
- Shops – closure of local shops.
- School – lack of school and difficulties in accessibility.
- Medical and child-care services.
- Lack of lifestyle choices.

For families, pull factors (to rural areas) include:

- Environment – better for raising children than urban areas.
- Local family ties.

For families, stay factors include:

- Desire to safeguard children's education and not create unnecessary upheaval.

For families, return factors include:

- Family ties.
- Perception a rural area is a good place to bring up a family.

Factors relating to people who are economically active

For people who are economically active, push factors (away from rural areas) include:

- Employment – lack of jobs with compatible skills or with good pay and security.
- Weak private sector – entrepreneurs tend to start businesses elsewhere.
- Public transport – lack of links to large job markets.
- Parental expectations and ambitions.
- Cost of living – perceived as higher in rural areas.

For people who are economically active, pull factors (to rural areas) include:

- Access to specific jobs – such as oil and gas work.

- High quality natural environment and availability of a range of activities.
- Knowledge and familiarity with area.
- Access to affordable housing.
- Perceived lifestyle improvements – safer and being closer to family.

For people who are economically active, return factors include:

- Availability of suitable employment.
- Affinity with the region.
- Family ties and care obligations.
- Social ties – strong sense of community.
- Appreciation of rural lifestyle.
- Desire for a lifestyle change and better work-life balance.

Factors relating to older people

For older people, push factors (away from rural areas) include:

- Limited supported and residential accommodation.
- Poor access to services – particularly healthcare and leisure.
- High turnover of healthcare practitioners – low expectations.
- Social isolation – distance from family.
- High cost of living – particularly fuel.

For older people, pull factors (to rural areas) include:

- High quality natural environment and scenery – tranquillity and perceived better quality of life.
- Knowledge and familiarity of specific area.
- Access to low cost housing.
- Change of employment status – being close to employment no longer required.

In summary, the review showed the enhanced emphasis on factors relating to lack of opportunity, including around employment, services and amenities in rural out-migration decisions. Younger age groups in particular were observed to leave rural areas in pursuit better access to employment and education, to gain new experiences, and expand their freedom and autonomy. Key points were:

- Factors related to access to employment opportunities were important for young people and people who are economically active.
- Access to higher education was a push factor for young people.
- Factors related to the availability of affordable housing were important for young people in particular, and to some extent for other groups.

- Poor access to services was also a push factor for all groups, although the emphasis varied, with young people emphasising access to shops and leisure services, families lacking schools and medical services and older people pointing to a shortfall in medical and leisure services.
- Poor public transport represented a push factor for young and economically active people.

For context, this report was written at a time when “more people have been moving into rural Scotland than have been moving out” and “rural Scotland experiencing higher levels of migration-related growth than the rest of Scotland”, although a focus of growth on accessible rather than remote rural areas was noted.

Unemployment, low paid jobs and declining rural industries

The Scottish Government (2010) considered employment as both a push and pull factor in different context for different people. It can be considered a push factor in contexts where the jobs available in rural areas do not align with the interests of the individual and can affect people at all stages of life including school leavers, graduates, and those already economically active. Particular issues with rural jobs which mean they act as a push factor include poor pay, due to a weak private sector, and lack of security, due to prevalence of temporary contracts and agency work. However, the report also argues that the presence of jobs which align with a person’s skillset can be a strong pull factor to a rural area.

Karcagi-Kovats et al (2012) reviewed EU member states’ strategies on addressing rural population decline. The depopulation factors most commonly identified in these strategies were ageing population and unemployment, living conditions, social and public services, low salaries, and declining agriculture. The paper notes that in the UK national rural development programme, the following factors were identified:

- An ageing population.
- Living conditions.
- Social and public services.
- Women and young people.
- Declining agriculture.

The review concluded that stabilising rural populations requires diversification of activities away from agriculture and general improvements to the quality of life. Rural development policies need greater focus on economic and social elements, and the ecological impacts of rural depopulation require consideration in greater depth.

The paper quotes sources from the wider literature on the subject, which suggest that the function of rural areas could be classified by (i) Agriculture and agribusiness and (ii) Rural services. These functions often conflicted.

Low availability of public services/amenities

Declining populations are associated with a loss of local services such as hospitals, education, leisure, and recreational sites which are centralised due to lack of 'critical mass', and with time the population which relies on these services will relocate to areas where they are more accessible. Limits to the availability of public finance represent an additional constraint in this context.

Nielsen et al (2012) suggest the ageing population in rural areas is skewing the service provision offer away from young people, which is creating an issue with retaining this group. In some areas the situation is exacerbated by in-migration. A discussion on the subject of Internal Migration in Scotland and the UK (2020) used Argyll and Bute as a case study. The local authority in this area, which is a popular retirement location, regularly reports significant skills gaps and unfilled vacancies in areas such as health and social care, where there is greater demand due to the population profile.

There is some evidence to suggest that satisfaction with services can be higher in rural areas. Using findings from the Scottish Household Survey, Place-based policy approaches to population challenges: Lessons for Scotland (2022) found that there was no evidence that perceptions of public services were systematically weaker in remote and Island Local Authorities (LAs). While factual evidence regarding the quality of services in remote and Island communities compared with the rest of Scotland was mixed, satisfaction with public services tended to be higher in these LA's than in other parts of Scotland. This was true, even for public transport. The paper outlines the following limitations to the analysis:

- Aggregation over Local Authority areas prevents insights regarding variations by local area, specifically understanding of the influence of local perceptions on population trends over time.
- A gap in understanding regarding the role perceptions of what services might be like, play in people's in-migration decisions or to what extent actual poor local services performance has motivated out-migration.

However, at the general level the reports concludes that it is unlikely that population decline in some rural areas was driven by poor perceptions of public services.

The Scottish Government (2010) report on rural migration undertook a review of location choice factors in remote rural areas. While the factors identified in this report were not based on a comprehensive survey, the report collates evidence from a large number of local studies. This may help address the limitations listed in above source. The report lists a lack of services and amenities as a push factor for people of all demographics. For young people the lack of higher education institutions and poor choice in leisure and recreational facilities caused people to move away for better opportunities. For families, the lack of childcare services and difficulty in accessing schools was determined as a push factor in a 2004 study of migration in North Lewis and Roxburgh. For older people the lack of supported and residential accommodation and poor perceptions of healthcare services were found to be push factors in a 2009 study in Orkney.

Lack of Affordable Housing

Scottish Government (2010) concludes that the need for more housing is a key theme in rural location decisions for both younger and older people. The report quotes evidence from a 2009 study in the Highlands & Islands which found that lack of affordable and low-cost housing and a lack of choice in the housing market are particular challenges for young people. Young people are disadvantaged in housing markets because they are "continually competing with others with deeper pockets, be they older residents with established careers and smaller mortgage requirements, or retirees looking for a rural retreat". For older people, push factors relate to high costs and poor access to housing maintenance.

In addition, the report highlights the following issues with relevance to migration:

- The housing needs for in-migrants could be better supported, for example through offering temporary accommodation.
- The impact of second home ownership on rural housing markets presents a challenge.

There is evidence from the UK House Price Index (2022) for Scotland that house price growth is significantly higher in many remote and island areas compared to the Scottish average. Table 2-4 shows the percentage difference in prices between October 2022 and October 2021 for local authorities with the largest portion of their population in remote rural areas, based on Scottish Government Urban Rural Classification 2020. Predominantly rural areas experienced substantially higher growth in house prices than Scotland as a whole.

Table 2-4: House Price Growth In Remote Rural Council Areas and Scotland Wide

Local Authority/Area	% Population Remote Rural (2020)	% Difference in House Prices (October 2021 – October 2022)
Na h-Eileanan Siar	72.5%	37.9%
Shetland Islands	70.4%	18.3%
Orkney Islands	66.5%	20.2%
Argyll and Bute	43.2%	21.3%
Scotland Wide	5.5%	8.5%

2.2.1.4 Summary of Key Points

- Household location choice is a two-stage process, first the decision to move is made, second the choice of the new residential location is made.
- Recently, the cost of living has been a key consideration in making the decision to move and location choice in the UK, particularly for young people.
- Decision to move is influenced by:
  - Life stage, with young adults in their 20s and 30s more likely to move.
  - Household composition and ownership, with larger and owned houses less likely to move.
  - Personal factors such as household formation and resolution, and education and work opportunities.
  - Transport considerations are secondary but reflect mode preference.
- Location choice is influenced by property price, population density, previous residential location, education opportunities.
- Availability of work is an enabler rather than a motivator and of declining importance as a motivator.
- Choice factors vary by age, with evidence that:
  - 18-24 year olds are motivated primarily by factors relating to familiarity with surroundings and people, cost of housing and vicinity to education.
  - For 25-34 year olds factor related to closeness to friends and families, the cost of housing and closeness to work opportunities were most important.
  - For the 55+ age group closeness to the countryside and the quality of housing were more important.
- While overall satisfaction with services is high in remote rural areas, access to specific services, issues related to access to specific services played a role in location decisions. Lack of employment and education opportunities were important push factors for young and working age people. Access to schools and childcare were a push factor for families. Poor access to services particularly healthcare was a key motivator for out-migration among older age groups. Limited access to services, shops and leisure opportunities featured for the young. Poor public transport also represented a push factor for some groups.
- Availability of housing is a key constraint for initiatives looking to retain and attract population to rural areas.

2.2.2 To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses

This section explores the importance of transport connectivity in location choice and differences in perception of what 'good' transport connectivity looks like. The section also discusses the role of digital connectivity in supporting the vibrancy of small businesses, who represent key employers in rural areas (following conversations with the client, business location choice is only being viewed through the lens of household location).

2.2.2.1 Transport Connectivity

Evidence on the importance of transport connectivity in household location choice decisions was mixed.

Research by Nationwide found that good transport connectivity, if not a location factor in itself, increased the value of a property. The premium paid for properties 500m from a rail or subway station in Glasgow, compared to 1,500m away, increased from 3.5% in 2019/20 to 7.2% in 2020/21.

In rural areas, experience from the Borders Railway, as detailed in the Year 1 Evaluation (2017) showed the influence of improved transport connectivity on household location choice decisions. A survey of users found that 52% of users who had moved house since the line reopened stated the railway was the main factor, or "one of a number of important factors" in their decision to move to their current address. 64% of those who moved to the Scottish Borders said they would not have moved to their current address if the railway had not reopened.

However, there is considerable evidence that other factors matter more. Following a review of empirical studies reporting in the literature and a housing market estimation study in the Netherlands, Zondag & Pieters (2005) conclude that:

- When making the decision to move households are less likely to move away from accessible locations.
- When looking for a new location travel time variables will affect the size of the search area.
- For many households, the accessibility of a specific location is not a significant location choice factor.

It should be noted that in the Netherlands accessibility changes between regions are comparatively small.

This finding is widely supported by the literature. Similar work by Molin and Timmermans (2003) in the Benelux (Belgium, Luxembourg and Netherlands) confirms that accessibility considerations are significantly less important than housing or neighbourhood attributes and this is confirmed by a report by Kryvobokov & Wilhelmssen (2007) focused on Donetsk.

A paper reporting the calibration of a household location choice model for Leicestershire by Revill & Simmonds (2011) states that "the accessibility variable is essential" and consists of components relating to accessing different types of opportunity, including jobs, healthcare or shopping. However, the model found that the cost of the location was significantly more important than the accessibility, such that a household is 0.56% less likely to choose a location for every £1 per week increase in location cost relative to the alternative but only 0.03% less likely to choose a location for every one minute worsening in accessibility relative to the alternative.

The lack of emphasis placed on transport factors in the literature reflects transport's role as a supporting service, which facilitates access to other opportunities and services, rather than being an end in itself. Charles (2010) describes transport as a derived demand with users of transport "primarily consuming the service not because of its direct benefits, but because they wish to access other services".

Hence transport connectivity needs to be considered not simply as a location choice factor in itself but also more specifically in the context of access to services and opportunities it enables. According to Marchetti (1994) the average time people spend commuting to work in a day will tend to approximately one hour over longer periods of time. This equates to a journey to work of half an hour. As technology advancements have enabled faster transportation, this has resulted in increases in average distance travelled but travel time has remained roughly constant.

By this argument, the availability and speed of transport connections substantially influence household and employment location patterns. In remote rural areas a half hour travel time to employment opportunities in key centres cannot be met. Based on the 2019 Scottish Household Survey Travel Diary, 22% of workers in these areas have a journey to work longer than 30km, compared to 18% in accessible rural areas, 14% in remote small towns and 11% elsewhere. Given the sparser distribution of employment opportunities in the rural context, Marchetti's constant therefore highlights the importance of transport in defining constraints on the acceptable distance of household locations.

Variation by demographic characteristics

In a paper examining the scope for targeting increased use of public transport through land use planning policies, Nurlaela & Curtis (2012) suggest that the influence of transport connectivity on location choice is informed by a person's preferred mode, and individuals will select a property which supports their preferred mode. For example, if a person's travel preference is to use public transport, they will locate in an area where this is provided for, and similarly if they prefer to use a car, they will locate where driving is unconstrained.

'Transport connectivity' in this context does not have a fixed meaning and alters depending on individuals' preferences. Individual preferences show significant differences between age groups. A report by UWE Bristol Centre for Transport & Society (2018) found younger generations today are much less likely to hold a drivers licence compared to 30 years ago. In 1992, 48% of 17-20 year olds and 75%

of 21-29 year olds held a driver's licence. By 2014 this had fallen to 29% of 17-20 year olds and 63% of 21-29 year olds. The reasons stated in the report include the increasing costs of motoring and learning to drive, postponing of parenthood and living with parents longer, increased urbanisation, and increased participation in higher education.

This may present a barrier to attracting young people to rural areas given the largely car dependant nature of these areas.

2.2.2.2 Digital Connectivity

The importance of digital connectivity is a relatively recent phenomenon. However, there is a growing body of evidence which recognises the importance of digital infrastructure to the modern economy and society, and the consequential impact this can have on property prices.

Households

In a policy paper on digital connectivity, the Association of Directors of Environment, Economy, Planning & Transport (ADEPT) (2019) suggest that "digital infrastructure is now as important to our economy and society as traditional infrastructure and utility services", that "good digital connectivity is a vital element of everyday life and has become increasingly important for ordinary activities".

Lehtonen's (2020) study into rural population changes in Finland concluded that "broadband availability is an increasingly important part of the critical infrastructure that impacts business and household location decisions". In a study which analysed broadband availability and population data using difference-in-difference regression techniques, they showed that broadband availability reduced depopulation of remote and sparsely populated areas by 0.4% annually compared with alternative scenarios without broadband provision.

The UK's Superfast Broadband State Aid Evaluation (2022), which examined the impacts of subsidised superfast broadband roll out to areas where this was not commercially viable, found that the roll out of superfast broadband between 2012 and 2019 resulted in a house price premium between 0.6 and 1.2%.

The evaluation's review of the business and economic impacts of subsidised superfast broadband delivery also highlighted:

- an increase in the number of businesses located in the target area by around 0.5 percent.
- a 0.6% increase in employment and reduced unemployed claimants by 32 for every 10,000 premises upgraded.
- a 0.7% increase in hourly wages.

Given the predominantly rural nature of the target areas the report noted that "the programme may have encouraged the relocation of economic activity to rural areas" and enhanced their viability.

While there is limited evidence exploring the links between digital connectivity and household location choice, a 2019 study examining patterns of broadband speeds and property prices across urban and rural locations by Housesimple (2019) found that house prices in the UK were 24% lower on the streets with the slowest broadband speeds compared to the average for the postcode district.

A study of the impact of broadband availability and adoption on economic growth of rural areas in the US undertaken by Whitacre et al's (2014) found that broadband adoption had a positive impact on employment and household income. Low levels of adoption led to a decline in employment and the number of firms. The study also found that broadband availability had limited impact, and concluded that future policy should be more demand orientated.

These findings highlight that improvements in digital connectivity could address lack of access to employment opportunities and concerns over pay, which were noted above as a key push factor in rural migration decisions.

Role of Digital Connectivity in Supporting Small Businesses

Serwicka & Swinney (2016) suggest a declining rural population can be exacerbated by business location choice as there is a circular relationship between business and household location choice. Businesses will locate where there are workers and customers, and households will locate where they are accessible employment opportunities and services.

Data on rural employment provided in Section 2.1.2 highlighted the role of micro-businesses and self-employment to rural employment structures. This section therefore examines the role of digital connectivity in supporting rural Small and Medium-sized Enterprises (SMEs).

While this is not strictly limited to household location decisions, these businesses usually move with their owners and the role digital infrastructure can play in supporting them is therefore discussed here.

In the context of a study drawing on a review of international literature and case study evidence from rural south-west Shropshire, Philip & Williams (2019) stressed the role of SMEs in rural employment, and identified three key sectors for SME activity in rural areas:

- Farming.
- Tourism and Leisure.
- Arts and creative industries.

With respect to farming, Philip & Williams (2019) note an increasing dependency on digital connectivity. Key requirements are:

- Access to information, including weather forecasts and price information.
- Farm governance requirements, including notification of livestock movements.
- Access to digital innovation, including data driven digital farming.

Tourism is said to increasingly depend on digital support before, during and after their visit:

- To enable online bookings.
- To enable holiday related and routine internet use during tourists' stay.

Their study reported findings from the Rural Public Access Wi-Fi Services project (Rural PAWS) that tested the impact of deploying project-specific broadband services to remote rural households in order to examine personal and business-related behaviour. The study noted the following issues that compound the vulnerability of rural businesses in the two above sectors:

- Limited access, quoting secondary evidence that 10% of farmers in England and Wales did not have access to a computer in 2015.
- Poor digital infrastructure. Participants were disadvantaged not because they were not connected but because their digital connectivity did not adequately support their requirements.
- Lack of digital skills among farming communities.
- Personal motivation. Where individuals do not feel the need to improve their internet literacy, they tend not to be aware what the improvements offer to their business.
- Lack of options to move businesses rooted in immobile cultural and natural resources.

In conclusion of the trial, the paper highlighted the importance of fit-for-purpose digital infrastructure for rural household and business unit livelihoods, noting that over time this can address skills and attitudinal barriers. Improving the broadband quality for home-based rural businesses over the medium term led to improved internet competency through informal upskilling, creating a virtuous circle addressing a key barrier to internet use in some rural sectors.

The Scottish Government defines crofting as "a system of landholding, which is unique to Scotland, and is an integral part of life in the Highlands & Islands".

Crofters are a small-scale landholder normally tenant landholders, who often use shared facilities including common grazings. Crofters often depend on mixed incomes substituting farming yields with other types of economic activities.

Digitally enabled initiatives such as the Croft IT, a project by Scottish Crofting Federation project can bring modern technologies such as advance soil monitoring

and reduce the penalty of distance by creating communities of practice, providing opportunities for sharing knowledge and networking.

The project highlights opportunities for bringing self-employed communities together online, duplicating “Learning” aspects of agglomeration digitally.

Creative industries

Townsend et al (2014) assessed the role of broadband in the operation of rural businesses in a paper on the issue of economic and social sustainability of remote rural places across Scotland. The paper specifically investigates the importance of digital connectivity for SMEs, noting that rural areas in the UK attract newcomers who bring their businesses with them. Through a literature review and in-depth interviews predominantly with rural creative practitioners, they found good quality broadband had acted as a pull factor, removing the "penalty of distance” associated with being located in rural areas and expanding a practitioner’s network. 12 out of the 15 interviewees had relocated to rural areas and nine interviewees were located in remote or very remote rural areas in Aberdeenshire and the Highlands and Islands.

Digital connectivity was said to enable:

- Networking with peers and clients.
- Access to markets.
- Innovation, i.e. staying abreast of sector-relevant developments.

However, following their move connectivity was often found to be insufficient, had not been upgraded in line with urban areas, or was found to be too costly, eroding their competitiveness. As a consequence, businesses owners were struggling to survive, and some considered relocating again.

The paper suggests that a large divergence in digital connectivity from the standard provided in urban areas reduces the competitiveness and sustainability of rural areas and emphasises the importance of strong digital connectivity on retaining rural populations.

2.2.2.3 Summary of Key Points

Transport connectivity:

- Evidence of the importance of transport is mixed, with some evidence from house price stats and the evaluation of PT improvements showing that this can be distinguishing factor, if not a key motivation.
- While transport accessibility was found to impact, other factors including housing and neighbourhood attributes matter more.
- Transport is a derived demand, and hence often not explicitly stated as a location choice factor. However, it enables realisation of opportunities in connection with other choice factors.

- In rural areas maximum acceptable travel distances to key opportunities and amenities represent a constraint on household locations.
- Individual mode preference matters. Reduced car ownership and ability to drive, as well as car scepticism among young people may present a barrier to rural resettlement initiatives in this context.

Digital connectivity:

- Limited explicit exploration of the linkages between digital connectivity and household location choice found.
- Evidence from house price statistics suggests high quality digital connectivity adds to the attractiveness of residential locations, with high internet speeds commanding a house price premium.
- There is some evidence that digital connectivity improvements can increase the number of businesses, reduce unemployment, and increase pay, highlighting opportunities to address key rural migration push factors.
- A high proportion of rural employment is provided by SMEs. Digital connectivity is important to the vibrancy of key rural SME sectors, including the Creative sector, Farming and Tourism.
- Digital connectivity is a key pull factor for owners of creative businesses in the Highlands and Islands. However, in reality the quality of connection provided often falls short of securing competitiveness and this can be a barrier to retaining such businesses.

Rural farming and tourism SMEs tend to be immobile, tied to the location of natural resources. Digital plays a key role in supporting viability of these businesses. It enables access to customers and information, assists with business administration requirements and enables innovative production methods. The quality of digital connections often prevents digital technologies from optimally supporting these businesses. If provided, improvements in connection quality have been found to address other barriers, e.g. related to competency levels in the longer term.

2.2.3 To what extent are Digital Connectivity and Physical Mobility (i.e. transport) substitutable

While many academics believe the advances in technology and digital connectivity will impact transport operations (such as Connected Autonomous Vehicles and Mobility as a Service platforms), there is limited evidence this will substitute demand for transport. Innovate UK's report on the UK Transport Vision for 2050 states "we expect to see an increase in the use of most travel modes" and digital connectivity will "create opportunities for greater efficiency, new services for travellers, and new business products and services". Between the years 1994 and 2019, when availability and effectiveness of technology and digital connectivity rapidly increased, road traffic increased by 28% based on DfT (2022).

However, while digital connectivity is unlikely to replace demand for transport in the near future, this does not mean to say that it cannot play a role in improving connectivity where transport choices are limited.

In a report for the EU's Improving Transport and Accessibility through new Communication Technologies (ITRACT) Salemink & Strijker (2015) state that, where increasing car ownership undermines demand thresholds for viable public transport and leaves those without a private car with fewer mobility options, connectivity can be facilitated by digital technology rather than physical mobility. "Digital connectivity can replace physical transport, whether by car or public transport", providing opportunities to positively impact equality with people experiencing transport poverty now able to "become better connected and gain greater access to broader society".

However, the report also highlights inequality risks associated with digital substitution, namely:

- Differential Information and Communications Technology (ICT) capabilities among highly public transport dependent groups causing the benefits to be skewed towards younger age groups, with potential risk of excluding older people without car access.
- Disadvantages to already excluded groups through reinforcing existing differences in financial resources, capabilities, aspirations, and social capital. These groups include older people with little ICT-related experience, low-skilled people, non-Western migrants, people in poverty, the visually impaired and physically impaired.

The report puts forward the importance of accounting for these risks by designing policies that equally consider the technological and social aspects when delivering ICT solutions.

2.2.3.1 Scope of Digital Connectivity Interventions

Brunori et al (2022) state that digitalisation has the potential to mitigate depopulation, social exclusion, and poverty in rural areas, but that it "should be intended as a means to an end, rather than the end itself". In a SHERPA Discussion Paper they identify four factors of attractiveness of any place, which digitalisation is able to support within a rural setting:

- Quality of the rural environment: digital technologies can help promote rural areas as destinations and market their products. Digital technologies can also enhance tourists' experience, for example through using virtual reality to create activities. Citizen science, i.e. the collection of data related to nature by the general public, can contribute to accumulation of knowledge and encourage participants to build identity.
- Quality of social relations: digital technologies can help overcome distance-related barriers to social relations.
- Quality of work: digital technologies mean people can work from home, reducing commuting.
- Quality of services: digital technologies enable e-commerce, online banking, home streaming and e-health and reduce the need for travel.

Therefore, in order to address rural depopulation, the applications of digitalisation in all four of these areas should be considered. The latter three are discussed in more detail in the following sections. Note that the first does not relate to the potential of digital connectivity to substitute transport and is therefore out of scope of this review.

It is noteworthy that the paper phrases these opportunities in terms of the contribution digital can make rather than substitution of transport interventions.

2.2.3.2 Access to Jobs and Home Working

Shrivastava (2012) suggests a number of ways in which ICT could make mobility in the UK more sustainable by reducing the need to travel. In this, home working and video conferencing were listed as growth areas. Homeworking has continued to increase since the publication of this report, and this was expedited by the pandemic. According to the World Economic Forum (2021), the pandemic led to a 20% increase in total internet usage and trends in remote working that are likely to persist. They also suggest that a work from home model "opens expansive opportunities for economic growth, global talent recruitment, job creation and, eventually, improved human prosperity and well-being". They suggest many organisations will likely continue operating remotely to reduce real estate costs. The experience during COVID-19 provided evidence that in many sectors digital connectivity can at least partially substitute physical access to employment.

These trends are highly relevant in the context of rural depopulation. Remote communities across Scotland already experience relatively high levels of remote working as outlined in section 2.1.2. Leith & Sim (2022) note that "lack of career prospects" is a key factor in population decline in Scotland as a whole. In this context widening acceptance of home-based working demonstrates possibilities to attract members of the Scottish diaspora back to Scotland while working elsewhere.

In terms of the practicalities of substituting physical mobility with digital connectivity, Ye (2021) states that widespread digitalisation will need to overcome a number of issues including "lack of knowledge and capacity, high upfront capital costs, outdated regulatory models, lack of interoperable standards, the current semiconductor supply crunch, limited access to broadband, cybersecurity vulnerabilities, and concerns about compromised privacy and proprietary business information".

There may also be difficulties changing attitudes to homeworking. Technology alone did not lead to a radical change in working from home practices, instead it took a significant global event which necessitated a change in attitudes to home working among employers and employees for it to become more accepted and widespread.

Prior to COVID-19, take up of home working was limited to a minority of employees even in areas with excellent broadband connectivity and in jobs where it was easily possible to work from home. Felstead & Reuschke (2020) report that the proportion of UK employees working from home was 5.7% of workers in January 2020, immediately prior to the onset of the pandemic. By April 2020, this increased to 43.1%.

However, the research also highlights that 88.2% of employees who worked from home during lockdown would like to continue doing so to some extent, with 47.5% wanting to do so often or all the time. This indicates sustained support for a greater role of digital connectivity in the work context.

From an employer's perspective, there is some evidence that working from home increases employee productivity. In a UK study, Deole et al (2022) found that increased frequency in working from home is positively correlated with employees' self-reported hourly productivity.

However, the benefits are dependent on employees' circumstances. A cross-sectional study by Galanti et al (2021) found that family-work conflict, social isolation, and distracting environments at home all had a negative impact on productivity, and a systematic review of case studies by Hall et al (2022) found that homeworking increased work intensification, online presenteeism, and employment insecurity, resulting in psychological strain and poor levels of work engagement. The review noted that "homeworking as a choice is considered largely beneficial, but when homeworking is instead mandatory it is no longer deemed as advantageous and can have a negative impact on mental health".

Productivity of home-workers varied with demographics and occupation. With respect to demographics, females, older employees, and people unmarried without children tending to be more productive.

Evidence on the variability of productivity benefits by industry highlighted that occupations in goods production and educational services experienced a drop in productivity. This is consistent with variability by sector found by research reported in Bertschek et al (2016). Their paper highlighted the risk of a "pronounced skills bias" where broadband adoption results in skilled workers in service sectors enjoying higher wages, employment rates and rises in productivity, but these same benefits are not experienced by lower skilled works in labour intensive or manufacturing sectors.

Evidence on the sectors and income groups where homeworking is most prevalent is provided by ONS (2023). Reviewing statistics on homeworking by sector, by salary, and by employment status leads to the following observations:

- The data confirms that digital substitution is more prevalent in professional, managerial, and administrative occupations, with homeworking only or hybrid working accounting for 64% of managerial and senior official occupations, 71% of professional, 61% of associate professional occupations, and 51% of administrative and secretarial occupations. In skilled trades, sales and customer services, caring and leisure, and other manual and elementary occupations, home and hybrid working accounted for 20% or less of employment.
- The scope for remote working substantially varied with salary, with home or hybrid working accounting for 13% of employees with salaries below £10,000 and 80% of employees with salaries of £50,000 or more.

- Homeworking was more common for the self-employed, with 32% of self-employed working exclusively from home compared with 14% of employees.

2.2.3.3 Access to Services

Wu et al (2022) studied the relationship between internet use and daily travel patterns using data from the Scottish Household Survey and the Integrated Multimedia City Data Survey. They found that “the increasing application of ICT in all aspects of daily life (e.g., teleshopping, telemedicine, and e-banking), which is brought about by technological evolution over time, enables and stimulates people to replace physical activities with virtual ones, particularly for those heavy ICT users dedicating a large share of their daily time budget to the Internet”. A discussion paper by Brunori et al (2022) supported this, stating that "digitalisation is rapidly changing some of the gaps in commercial services: e-commerce makes all types of commodities available in a few days. Home banking has already revolutionised the relation between citizens and their bank.” Shrivastava (2012) also identified synthetic environments such as online banking as a growth area in reducing the need to travel through ICT.

COVID-19 has substantially enhanced the evidence base on remote delivery of services including health and education. However, data analysed to date may be impacted by the pandemic and better understanding of the longer terms impacts is required to understand the scope for and enable planning for high quality remote delivery.

The Scottish Government’s Digital and Health Care Strategy (2021) emphasises the important role of digital technology in the future of healthcare, stating it can help address backlogs and increase capacity. Digital technology is expected to play a key role in embedding and sustaining health and social care integration. The strategy also recognised the shortcoming of digital reliance, namely the risk of digital exclusion and the need to ensure patients have a choice in how they access services.

A qualitative service evaluation undertaken by Schutz et al (2022) showed that the ability to substitute physical access to healthcare depends on the type of consultation. The study found that “there is an opportunity to have quick and stress-free [online] consultations as long as this is of a routine or follow-up nature. For more important treatment decisions and for some diagnostic consultations, patients in this study are clear that remote means are unlikely to be appropriate.”

In terms of the substitutability of education, a rapid evidence assessment by the Education Endowment Foundation (2020) found that “pupils can learn through remote teaching” and “teaching quality is more important than how lessons are delivered”. However, “ensuring access to technology is key, particularly for disadvantaged pupils”. The report also noted the importance of peer interaction to provide motivation and improve learning outcomes for pupils working remotely, and noted that pupils may require additional support to work independently. However, data analysis from ONS (2021) found that “remote learning was, at best, a partial

substitute for in-class teaching during the coronavirus (COVID-19) pandemic, as pupils covered substantially less material when working from home than their peers in the classroom, according to teacher assessments." The analysis also noted that teaching was more substitutable in primary school than in secondary school, and less substitutable for arts subjects. Remote learning may also increase inequalities, with a lower proportion of in-class learning material covered in schools with a higher proportion of pupils eligible for free school meals, and teachers at those schools also reporting a pupils' learning being more dependent on parental instruction.

For university level education, an article by the World Economic Forum (2022) stated that although lecturers faced a "steep learning curve when adapting to new teaching technologies at the start of the pandemic", in some cases online learning was actually more productive. However the article notes a digital divide among students, depending on their ability to access online platforms and services, and analysis by the ONS (2020) found that 29% of students reported being dissatisfied or very dissatisfied with their experience in the autumn term of 2020.

There may be geographical differences in substitutability of services. A report by Hirko et al (2020) examined a case study of a telehealth program implemented in rural Michigan in response to the pandemic. The report recognised the potential benefits of telehealth on rural communities by removing the need for travel and improving operational efficiencies. However, the report also noted that during the COVID-19 pandemic discrepancies in access speeds presented a challenge in delivering rural health care. Similarly, Steele & Lo (2013) reported that "remote and rural areas may often not have the bandwidth to support all types of telehealth applications".

2.2.3.4 Access to Shopping

The potential for digitalisation to substitute physical mobility for shopping is noted by Brunori et al (2022) and Shrivastava (2012). However, based on data collected before the pandemic, there was limited evidence that this was occurring. Hesse (2002) hypothesised that "e-commerce is likely to reinforce longstanding trends of transport growth, rather than breaking them". A study by Rohr & Fox (2014) found that although e-commerce can result in the removal of shopping trips and replacement with online purchases, it can also result in new and longer shopping trips such as making a specific trip for a specific item.

Research suggesting trip reductions in response to greater digital connectivity was limited before the pandemic is confirmed by data on trip purpose shares for journeys in Scotland from The Scottish Household Survey (2023). Little change was observed between 1999 and 2019, with the share of shopping rising only minimally from 22.7% of journeys in 1999 to 23.6% in 2019, despite the increasing prominence of e-commerce. It should be noted that average trip making remained largely unchanged. The mean number of trips per day recorded by the survey reduced minimally from 2 in 1999 to 1.9 in 2019. While the proportion of shopping trips increased temporarily during COVID-19, data for 2021 (23.7%) saw a return to 2019 levels. More recent data was not available at the time of writing.

However, digitalisation has the potential to narrow urban rural inequalities in accessibility to shopping. Evidence from a questionnaire undertaken in rural Wales by McHugh (2014) argues that "rural consumers use the internet to overcome any retailing limitation they feel present in their settlements", although "rural residents do not complete more purchases online than urban residents, and respondents in both rural and urban settlements shop equally online and through brick-and-mortar retailing".

However, there are barriers to substitutability of retail in rural areas. Analysis of customer complaints data reported in Citizens Advice Scotland (2012) highlighted that at least 1m Scots face surcharges, late delivery or refusals when trying to access goods online. Surcharges for consumers in the highlands and islands amounted to an average postcode penalty of nearly £15 and £19 per delivery, respectively.

2.2.3.5 Social interactions, leisure and entertainment

The potential for digitalisation to substitute physical mobility for entertainment is noted by Brunori et al (2022). However, a study by Rohr & Fox (2014) assessing the evidence of car traffic levels in Britain found that although "in some cases, online interactions might replace social interactions; alternatively, by widening an individual's social network, this technology may be complementary with travel because social networking increases the ease of connecting with others."

2.2.3.6 Summary of Key Points

- Based on increase in traffic levels between 1994 and 2019 there is little evidence that increased digital connectivity automatically results in trip substitution. However, there may be a role in enabling access to opportunities and wider society in contexts where transport connectivity is limited.
- Factors related to the distribution of connectivity and digital enablement may reinforce existing exclusion patterns, and equality impacts may need consideration.
- Digital infrastructure could mitigate depopulation by supplementing rather than substituting accessibility to jobs, services and social relations.

Work:

- During COVID-19 home working substituted physical commuting in many sectors, and many organisations are expected to retain this to cut costs.
- Attitudinal barriers need to be addressed; however the COVID-19 experience has helped in this regard, with 88.2% of workers who worked from home during lockdown would like to continue doing so.
- Widening acceptance of home-based working could address a lack of career prospects as a key driver of out-migration.
- Wider long-term adoption of home working requires addressing barriers in terms of knowledge and capacity, regulation, capital costs and cyber security.

- Scope for substitution varies by sector. Skilled jobs in service sectors and managerial occupations are likely to be more substitutable and lower skilled jobs in goods production less so. The self-employed are more likely to work from home exclusively.
- There is a strong correlation between substitutability and income group.

Services:

- Digital substitution in services is a key growth area, teleshopping, telemedicine and online banking are significant applications.
- Scope for digital substitution in service delivery varies by activity. In medical applications, routine and follow up consultations offer scope for substitution and more complex diagnostic consultations less so.
- On remote learning, ONS evidence suggests person to person contact was considered partially substitutable at best, more substitutable in primary than secondary and less so for arts subjects than sciences.
- Remote learning at universities was more productive in some cases, so long as barriers around lack of access to digital platforms were overcome.
- The evidence highlighted substantial equality issues that need consideration.
- Shopping and socialising:
- There is limited evidence that increased uptake of e-commerce opportunities reduced shopping trips, although it may help overcome some gaps in the provision of traditional retailing in rural areas.
- Deliveries to remote communities can be refused or face substantial surcharges.
- There is some evidence of substitutability with respect to social interactions. However, there is also some evidence that social networking online is complements rather than substitutes transport.

2.2.4 To what extent do the above variables impact on depopulation occurring within communities?

This section of the literature review will discuss digital intervention in the context of rural migration, including consideration to the scope for substitution and unintended consequences.

2.2.4.1 Addressing Rural Shortfalls in Transport Connectivity

Highlands and Islands Enterprise (2022) research has explored a range of topics related to life in the Highlands and Islands. The research collected views from over 5,000 adults living in the Highlands and Islands. Respondents were asked what things are needed for their community to thrive. While the survey did not directly investigate depopulation, the ability of rural communities to thrive is closely linked. Improved local transport connections were cited by 15% of respondents, and improved transport connections between my local area and other parts of Scotland selected by 16%. 20% quoted improved broadband, and 11% said improved mobile phone coverage was a priority. By comparison 47% said housing for local families

was needed for the community to thrive, followed by more job opportunities (32%), and local businesses and trades (24%).

Porter & Turner (2019) found for young people education and skills development opportunities are typically focused on urban centres, which "restricts opportunities for skills development and the take-up of learning and training opportunities in more remote rural areas". They state that "Transport and travel are likely to play a crucial 'cause and effect' role in exacerbating poor skills and low productivity, especially in contexts where transport density is low and subsidised transport is unavailable".

The importance of transport in addressing rural depopulation challenges is also confirmed by Skerratt (2018) in a report prepared for the Prince's Countryside Trust. Based on surveys of over 3,000 respondents in England, Scotland and Wales, the research identified that poor broadband and mobile coverage, poor road and transport networks, and a poor variety of employment opportunities are the top three barriers facing remote rural communities and links these barriers to the out-migration of young people.

Based on 2020 data from the Scottish Index of Multiple Deprivation (SIMD) reported in the Scottish Government publication Rural Scotland Key Facts 2021 public transport accessibility to key services is a key challenge in remote rural areas:

- only 40% lived within a 15-minute public transport journey from the nearest GP (compared with 92% in non-rural Scotland).
- 63% lived within a 15-minutes journey from the nearest Post Office (compared with 96% in non-rural Scotland).
- 29% within a 15-minute public transport journey to the nearest shopping facility (compared with 81% in non-rural Scotland.

This is reflected in the findings of Scottish Government (2010), which lists Transport as a 'push' factor for young people moving out of rural areas stating "insufficient public transport adds to feelings of social and economic isolation". Specific concerns around public transport are centred on the high cost and lack of connectivity it offers to rural jobs, which is "reported to restrict young people's employment choices" both from the employee's point of view and employers who may be "put off employing young people with particularly poor public transport connections". Among those who are economically active the same report states a shortage of public transport links, and high transport costs where they do exist, were found in a range of studies in Orkney and the Outer Hebrides to restrict residents access to job opportunities and important services.

The continued relevance of transport challenges faced by rural communities is confirmed by a survey of 5,301 adults conducted by Ipsos on behalf of Highlands and Islands Enterprise (2022) (HIE). The survey reviewed respondents' satisfaction with the reliability, frequency, and cost of transport services. Table 2-5 below shows satisfaction scores statistics by mode of transport. Bus scored highest on reliability when compared with rail and ferry, and ferry scored highest with respect to frequency. Cost emerges as a key concern, with 52% of rail, 36% of ferry, and 24%

of bus passengers stating that they were dissatisfied with the cost of travel. This is consistent with the Scottish Government (2010) finding that high cost of public transport is a push factor for rural migration.

Table 2-5: Public Transport in Highlands and Islands (Net Satisfaction Score, i.e. Percentage satisfied minus Percentage dissatisfied [Percentage dissatisfied]). Source: Highlands and Islands Enterprise (2022) Ipsos Survey of 5,301 adults

Category	Rail	Bus	Ferry
The reliability of the service	19% [25%]	30% [22%]	11% [34%]
The frequency of the service	18% [25%]	16% [31%]	26% [26%]
The cost of travel	-31% [52%]	20% [24%]	0% [36%]

Poor service provision results in high levels of car dependency in remote rural communities. 80% in remote rural areas travel to work by car either as a driver or as a passenger, for example, compared with 64% in the rest of Scotland. 49% report fuel poverty compared with 24% in the rest of Scotland based on data reported in Rural Scotland Key Facts (2018).

While the discussion in Section 2.2.3 highlighted that digital is likely to supplement rather than fully replace transport connectivity, substitution has potential to mitigate push factors related to the high cost of transport in rural areas.

Based on findings from a case study of two rural communities in England and Scotland, Ashmore et al (2014) reported potentially positive impacts on economic viability, age diversification, and community growth if there is strong digital connectivity, and perceived exclusion from wider society among those in rural areas if provision is poor.

Nielsen et al (2012) examined different models for rural service provision in order to inform recommendations for service delivery in rural areas that participate in the EU's Interreg programme. Their work included an analysis of constraints and opportunities afforded by digital connectivity. The study highlighted potential for digital delivery to play a role in developing and maintaining viable services. However, the paper notes that in order to ensure rural populations can take advantage of those opportunities they need to:

- Develop the necessary organisational structures and competencies.
- Provide universal connectivity and access to broadband and smartphones.
- Close the digital gap between different age and social groups.

Velaga et al (2012) examined the role that transport telematics could play in addressing shortfalls in transport connectivity in rural Scotland, improving access to services and mitigating transport poverty in rural areas. Key applications they

considered were the improvement of passenger information and the provision of flexible and demand responsive transport.

They found that digital tools could make a substantial contribution to making better use of available transport resources and better aligning services to the needs of transport users. However, the effective implementation of initiatives to this end needs to overcome a number of challenges:

- A shortfall in understanding of digital infrastructure requirements in rural areas.
- Trust and reliability issues with the crowd-sourced information provided by passengers.
- Understanding their potential impact passenger behaviour.

2.2.4.2 Changing the definition of remote

Survey results reported in Skerratt (2018) highlight that individual's definition of remote rural are strongly influenced by connectivity considerations. Respondent's top three criteria related to:

- Need a car to access anything.
- Limited or poor infrastructure.
- Poor digital connectivity.

Indeed, this is reflected in the Scottish Government's definition, which links the definition of remote rural to a drive time of more than 30 minutes to a settlement of 10,000 or more.

Based on a review of international literature, Davies (2021) outlined the role of lack of employment opportunities as a key driver of rural out-migration. In this context, digitally enabled remote working could address various place-based barriers, including limited diversity in employment opportunities, limited opportunities for career advancement, and limited opportunities for social and economic advancement within rural communities. However, uptake in rural communities has traditionally been low. The paper argues that COVID-19 may have reduced key barriers to improved uptake of digitally enabled remote working in rural areas, namely by mitigating negative perceptions on the side of employers and employees, and building employer knowledge regarding how to manage a remote workforce.

This may enable rural residents to access a broader range of employment and stabilise declining populations. However, while advancing functionality and affordability of ICT solutions increasingly enable remote work practices, the paper highlights that the urban-rural digital divide remains a barrier. Unintended consequences such as isolation issues also need consideration.

A range of studies suggest that digital connectivity has the potential to reduce urban rural inequalities in access to jobs. Townshend et al (2014) argued that digital connectivity to rural areas can "provide opportunities to connect that compensate for difficulties associated with distance" and enable rural businesses to have a visible

identity and market access beyond their local area. Based on a review of international, quantitative research on telecommunications networks and broadband internet Bertschek et al (2016) found that their provision exerted a positive impact on economic growth and productivity, job creation, and at least partially, on economic development in rural areas.

A report by the Scottish Government (2022) suggests a recent trend in migration to rural areas is 'newcomers' from urban areas moving for a 'better life'. While data from the 2022 census is required to confirm and provide more insight into this trend, the report suggests this has been facilitated by:

- Increases in medium and long-distance car based commuting to urban areas.
- Strengthening broadband connectivity, enabling people to work from home more easily, with the 2011 census finding that in one in seven remote and rural parishes over 30% of workers work from home, much higher than the average from the whole of Scotland at the time.

While the first point suggests that improved transport connectivity has expanded the historical limits of urban travel to work areas, pushing back the boundary of remoteness, the second highlights that digital connectivity could to an extent remove it.

A range of sources recognise the potential role of remote working in this context. Leith & Sim (2022), for example, suggest that widening home-based working demonstrates possibilities for people to live in Scotland while working elsewhere. The potential of remote working practices as a driver of rural in-migration in Scotland is also supported by survey findings by Highlands and Island Enterprise (2022). 45% of respondents in their survey of over 3,000 residents in the Highlands and Islands region perceived that people had moved to their area because they can work from home. This differs within the different areas of the region with higher responses in many island regions, including Na h-Eileanan Siar (59%), Orkney (59%), Argyll and the Islands (52%) and Lochaber, Skye and Wester Ross (52%).

However, limited evidence was found regarding the extent to which this has materialised to date. The survey asked respondents who had not always lived in the Highlands and Islands to specify their reasons for moving there. Only an average of 3% said that "Remote working meant I didn't have to stay where I was". Other factors such as "better lifestyle/quality of life" (36%), "to take up a job" (26%), "to be close to family" (23%) and "I didn't want to stay where I was" (10%) were more important. This indicates that while remote working may be an enabler for some relocation decisions, it has not been a major choice factor in relocation to date. It should be noted that the survey did not take into consideration when respondents made the move.

Moreover, it is unclear from the results what role rurality plays. Given that reaching sustainable population levels in remote rural communities is often driven by small changes in the number of households, relevant responses may get lost in the noise when examining regional results. Further study is required to confirm the impact

remote working has had on remote communities across Scotland to date, including the impact on existing populations, for example in terms of access to affordable housing.

2.2.4.3 Changes in age profile, employment profile and income structure

A study in Spain by Gonzalez-Leonardo (2022) reviewed patterns characterising rural in-migration during the COVID-19 pandemic in 2020 and 2021. The study suggested that the pandemic did not result in substantial changes in the macro patterns of internal migration, with the largest flow still between urban centres and their suburbs. However, COVID-19 had significant impact on the population size and structure of sparsely populated rural areas. In-migrants to rural areas consisted of a wide range of ages and included families as well as retired individuals. However, the increase in net-migration was much higher among people of working age than for the over 70 age group. This presents an opportunity to address concerns regarding the sustainability of rural communities due to an ageing population.

The Highlands and Islands Enterprise (2022) noted the following priorities by demographic group, with respect to work opportunities:

- 35% of men and 39% of people on lower incomes (Household income of £15,599 or less) cited more job opportunities (compared with 32% of all respondents).
- 30% of young people and 35% of people who plan to stay in the region for up to one year cited jobs that pay better (compared with 18% of all respondents).
- 23% of people aged 65+ cited more working age people moving into the area (compared with 32% of all respondents).

The experience of COVID-19 radically changed working patterns across the UK. A study by the Adecco Group (2020) found that 52% of respondents in a YouGov poll of 1,000 UK workers believed that a ‘reverse brain drain’ will occur with talent moving away from cities to more regional areas. In Scotland, the proportion was 46%.

However, there was a differentiation between sectors. More workers in white-collar jobs, including Finance and accounting, Media, Marketing and advertising, and Real estate believed professions would leave cities. Fewer workers in Manufacturing and Retail felt top talent would leave cities in favour of regional areas and remote working. This reflects the differential scope for remote working in different industries.

Table 2-6: Proportion of workers who believe professions will leave cities, Source: Adecco Group (2020)

Industry sector	Proportion of workers who believe that professions will leave cities
Finance and accounting	61%
Media, marketing and advertising	62%
Real estate	75%
Education	67%
Manufacturing	43%
Retail	42%

Based on a comparison with existing rural employment structures outlined in Section 2.1.2, this could increase rural employment in some sectors that are currently under-represented including the finance sector. It is also noteworthy that the profession associated with higher likelihood of “deurbanization” tend to be associated with higher-than-average incomes. As such, digitally enabled remote working could mitigate concerns over pay noted by young people and those intending to stay in the region in the longer-term during the Highlands and Islands Enterprise (2022) surveys.

2.2.4.4 Impact of Higher Education

Pursuit of higher education opportunities is quoted as a key push factor for young people leaving rural areas.

Only 3% of respondents who had not always lived in the Highlands and Islands in the surveys noted that coming back after completing higher education was one of their reasons. It is difficult to interpret this data without knowing how many move away, however, there is a suggestion relocation to study results in permanent loss of population to these areas.

An article referencing a Norwegian Government report (2021) highlighted the role of higher education in rural depopulation, quoting statistics that suggest that 60% of women and 52% of men who had moved from less central places had completed higher education, compared with 25% of men and 39% of women living in less central communities. The report recommends that higher education institutions should develop education opportunities that enable people to stay in rural communities rather than encouraging them to move to urban areas to study.

The formation of the University of Highlands and Islands, which was awarded university status in 2011 is intended to support local higher education opportunities. However, no evaluation of migration impacts of the institution has been found.

2.2.4.5 Pump Effects

Laird and Mackie (2014) considered the wider economic impacts of transport improvements in remote rural areas. Amongst other effects, the paper discussed location effects. The paper outlines that "centralisation in the provision of key services in remote rural areas is often a key consequence of improvements in transport quality", and that this can assist in cutting costs to the service provider as well as delivering a better product for customers. However, the paper also outlines the two-way road effect, sometimes referred to as "pump effect", whereby better access to services in more accessible locations undermines the competitiveness of businesses in the periphery. The paper argues that for transport improvements to be successful in driving rural regeneration, policy makers should identify sectors with a comparative advantage and support them with carefully considered planning policies.

These effects affect provision of key lifelines for remote communities, including public transport services and village shops.

In the context of digital connectivity, similar effects are noted by Cumming & Johan (2010) who suggest increasing digital connectivity to rural area households may actually damage rural economies as local businesses will be competing with a global marketplace offering more diversified products.

With respect to public transport services, the European Agricultural Fund for Rural Development (2018) argues that in such areas service providers may stop supplying areas where demand is reduced by dwindling populations and digital substitution. However, the report argues that well targeted digital strategies may also offer mitigation. An example quoted is the approach taken by smart villages, where communities identify common targets and use technology to help match demand to coordinate use of pool cars to provide personal transport. Similarly social businesses can play a role in coordinating orders and so enable delivery of goods to remote locations. An example given is La Exclusiva, a social enterprise which eliminates home delivery fees through pooling resources. Local co-working spaces, such as provided by the Connected Hubs can support the viability of such enterprises.

With respect to local shop closures, anecdotal evidence from Press and Journal (2015) linked the closure of a well-known shop in North Uist to the impact of supermarket deliveries from the mainland. While this is likely to offer a better deal to shoppers, the article highlights that local provision of Post Office services will cease with the demise of the shop.

While an investigation into the linkages between rural shop closures and rural out-migration reported in Amcoff et al (2010) found no significant impact on rural out-migration, quantitative evidence on the role of local shops provided by Association of Convenience Stores (2023) attests to their role in supporting inclusive local access to services, including:

- Bill payment services (73%).
- Cash machine (61%).
- Local grocery delivery (27%).
- Parcel collection point (26%).
- Post office (24%).
- Food bank usage (13%).
- Prescription collection (4%).

2.2.4.6 Service provision

The UK's Superfast Broadband State Aid Evaluation (2022) showed that some unintended consequences can occur on local services including schools and healthcare, which experienced a level of pressure due to increased population in some areas. The number of patients registered in GP services increased by between 3.2 and 5.9% for example. Mitigation for these unintended consequences requires consideration in the development of policies.

2.2.4.7 Summary of Key Points

- At the personal level, improved local and strategic transport and digital connections were highlighted by some Highlands and Islands residents as key in enabling their communities to thrive. However, issues around availability of housing and employment were scored higher.
- At the strategic level, low transport densities are widely recognised as a constraint on rural opportunities, including access to education, job opportunities, and services.
- As a result, poor transport provision specifically as a limitation to access to education and work opportunities is a push factor for young people leaving rural Scotland.
- Digital tools could provide opportunities to improve the efficiency of rural transport by improving passenger information and aligning available resources to demand.
- Cost of transport is a key concern. Digital could offer mitigation by eliminating the need for some journeys.
- High quality digital connectivity could also enhance rural quality of life, economic viability and address a range of wider exclusion effects, so long as digital exclusion effects are overcome.
- Improved transport connectivity has pushed back the boundary of remoteness. With respect to access to employment, more universal uptake of remote work

since the COVID-19 pandemic could fundamentally change the definition of remoteness. Further research is required to better understand the role this could play in developing sustainable rural communities.

- Evidence from COVID-19 shows that remote working could go some way towards addressing concerns over ageing populations in rural areas beneficially by enabling in-migration of working age population. It could also help address push factors related to low pay, by offering access to employment opportunities in sectors with above average incomes.
- "Pump effects" require consideration in policies that aim to address rural depopulation through connectivity improvements, regardless of whether they are physical or digital by nature. Centralisation of services and closure of local businesses are related risks.

2.2.5 Can potential future access interventions consider the above variables in the context of proactively supporting attraction and retention within locations of Scotland which have experienced, or are experiencing, population decline?

More complete exploration of the above research question will be reserved to the final reporting for the study. However, this section of the literature review presents some relevant information, regarding the barriers presented by the rural digital divide and intervention success factors highlighted by the literature. Some case studies providing evidence on potential interventions have also been included.

2.2.5.1 Barriers: the digital divide

The availability of high-quality digital infrastructure is key to enabling the effective and equitable deployment of digitally enabled policies to halt rural population decline. There are potentially significant geographic and demographic differences in the ability and willingness to substitute physical mobility with digital connectivity.

Townsend et al (2014) cast the rural digital divide in terms of the following problems:

- Poorer connectivity.
- Higher cost due to less supplier competition.
- Lower levels of adoption, due to demographic factors such as income, age, level of education and digital literacy.

The quality of digital infrastructure differs between urban and rural areas. The World Economic Forum (2021) reported that increased use of digital services and remote working during the COVID-19 pandemic resulted in a 20% increase in internet usage. Vodafone, a telecommunication company reported a 50% increase. The article reported a shift in internet traffic from urban to rural areas, which resulted in widespread internet blackouts in more spread-out residential areas and suburbs. This indicates that less than average internet connections may be unable to cope with the intensity of traffic in a situation where a large portion of households have substituted their physical mobility for digital connectivity.

Randall et al (2020) reported that between 30 European countries, the UK ranks 5th in terms of having the least digital divide, when percentage of households with Next Generation Access broadband is compared for all households and rural households. Additionally in the UK over 70% of people aged between 16 to 74 have basic or above digital skills, and the UK is among the only European country where there is not a notable skills gap between urban and rural areas. However, while the UK is performing better than many of its counterparts on this metric, rural constraints in digital connectivity exist.

Philip et al (2015) state that "within Scotland telecommunication infrastructure is uneven, resulting in spatial variations in the ability of private individuals and businesses to use the internet at a fixed location or on the move and geographical differences in internet speed, reliability, and choice of service provider". The pattern which occurs is urban and accessible rural areas are well served, but remote rural areas are poorly served. In Scotland the percentage of broadband connections with speeds less than 2.2Mbit/s was 13% in rural areas but only 9% in urban areas. This divide has been perpetuated by the development of Next Generation Access networks which have focused on urban areas and provide greater speeds and better reliability than previous connections. The percentage of premises (residential and commercial) with access to Next Generation Broadband (advance copper networks such as ADSL+ and fibre optic cables) was 16% in rural areas but 65% in urban areas.

According to Rural Scotland Key Facts 2021, in 2019 66% of remote rural households and 40% of households in non-rural Scotland used a Digital Subscriber Line (DSL) broadband connection which uses conventional telephone lines. This is significantly slower than Fibre Optic broadband which is used by 29% in remote rural areas and 53% of non-rural Scotland.

Wilson & Hopkins (2019) examined progress against the Scottish Government's target to connect 100% of premises to superfast broadband by 2021. The study found a substantial decrease in the number of superfast 'not spots' in Scotland. In 2016 their number was 654 and in 2018 this had reduced to 52. The paper noted that over the period examined, the boundary between digital hotspots and 'not spots' had shifted. At the start of the period this largely aligned with urban rural boundaries. However, by 2018 digital 'not spots' were almost entirely confined to those areas within the Sparsely Populated Area, that were located outside towns. The paper reports that improvements aligned with the urban rural hierarchy, with superfast coverage progressing most rapidly in urban areas, followed by small towns and rural areas outside the Sparsely Populated Area. Progress was slowest in Scotland's Sparsely Populated Area. Digital exclusion in those areas has been intensified by a number of factors:

- An increase in the importance of digital skills and behaviours among Scotland's wider population.
- Technological changes in areas of service delivery from which remote communities are excluded.

- The proximity of superfast 'not spots' to rural communities where access to superfast broadband has been improved.
- The increasing minority status of not-spot communities.

The paper argues that this exacerbates existing problems related to service delivery and declining populations in these areas and represents a further barrier to promoting then as an attractive place to live and work. Views from Highlands and Islands residents, cited in Section 2.2.4.1, underpin the importance of improved broadband and mobile network coverage to the future vibrancy of their communities.

Brunori et al (2022) suggested lack of motivation among rural areas may be a barrier for uptake of digital technologies, and hence have a negative effect on its substitutability for physical mobility. It is also likely that digitalisation of rural areas will not benefit all universally, with evidence from a Western Scotland Living Lab that "older members of the community are most likely to be marginalised from these services and opportunities".

2.2.5.2 Intervention Success Factors

Glass et al (2020) conducted a series of case studies on island repopulation initiatives. Across the eight examples, five cross-cutting themes emerged which provide learning points for Scotland and any future interventions:

- Financial resources are crucial: success depends heavily on a sound financial resource base. This can range from private donations and investment, upfront grants from public-private partnerships and public funding at a municipal level.
- Holistic initiatives with a suite of measures: Single, standalone initiatives will not address depopulation on their own. Instead, there is a need for a strong focus on complementary initiatives to promote the attractiveness of a region, raise awareness of opportunities, promote integration, and ensure availability of appropriate housing.
- Support from the community: Successful approaches tend to have a 'bottom up' aspect with communities having a central role in designing and/or implementing the initiative. It is important to note interventions also require a 'top down' support from a range of public agencies and other organisations to be successful.
- New/returning residents need to integrate well to ensure they stay: Emphasis is required on welcoming new/returning residents and ensuring they have the skills and understanding of the local community and economy to foster attachment to place. Additionally, initiatives should seek to increase the diversity of the population and balance the needs of encouraging young people to return (for example after finishing university) and targeting new residents from other regions and/or countries.
- Enabling a diverse economy: Policy initiatives should ensure people from across different job sectors can reside in remote areas – including 'digital nomads' travelling and seeking new places to work temporarily.

Support from the Community is discussed further in a paper on COVID-19 and rural economies by Phillipson et al (2020). The paper highlights that services and support in rural areas rely heavily on social capital provided by the voluntary, community and social enterprise (VCSE) ecosystem. In the years running up to COVID-19 self-organised initiatives and the voluntary, community and social enterprise sector have increasingly been relied upon for the provision of essential services. For example, village halls provide drop-off/collection points for shopping and medication, and some house services such as nursery, playschool, foodbank or post office, and the VCSE sector offers crucial support for vulnerable groups. There is evidence however that the sector is over-stretched and urgently requires support and assistance from Government.

The value of encouraging returning residents is also noted in Scottish Government (2010). Their report on rural depopulation initiatives states approaches should consider return migrants in addition to newcomers and measures should aim to reduce the stigma around return migration, re-establish contact to demonstrate how new opportunities have developed since migrants left, offer support to overcome perceived barriers associated with return migration and raising awareness of employment, education and lifestyle opportunities.

2.2.5.3 Case Studies

The following section will present some case studies on rural re-population interventions focusing on those which aim to compensate a lack of physical connectivity with improved service accessibility and digital connectivity. They will be assessed against the success factors highlighted above.

20 Minute Neighbourhoods

The role integrated land-use and transport planning can play in meeting communities' transport needs is recognised in the Scottish Government's Fourth National Planning Framework (2023) (NPF4).

20-minute neighbourhoods are promoted within NPF4 as a means of creating "connected and compact neighbourhoods where people can meet the majority of their daily needs within a reasonable distance of their home, preferably by walking, wheeling or cycling". The framework's vision with regard to this approach suggests roll out in remote rural areas is feasible:

"The principle may be adjusted to varying geographical scales from cities and urban environments to rural and island communities."

A paper by Scottish Rural Action (2022) reported on a practitioners' roundtable discussion on the potential application of the 20-minute neighbourhood concept in place planning for rural and island geographies.

In the context of rural areas, the paper found that when applied as a top-down planning process the approach could risk "exacerbating the centralisation of rural services and reinforcing structural and institutional barriers to addressing poverty and inequality in rural and island communities". Potential adverse impacts with

regards to reinforcing structural barriers to opportunity and participation in community life and hence exacerbating out-migration of young people are noted.

Moreover, the concept is only economically viable at a density of at least 65 dwelling per hectare which in rural areas only occur in small towns, volume new build estates, and main villages.

However, the paper highlighted that rural areas would be better served by a “living well locally” approach softening the prominence of focus on the stated time and distance thresholds and recasts the key rationale for 20-minute neighbourhood in terms of living well locally initiatives, which capitalise on rural assets including sense of community, culture and history, food and energy production capacity, and micro and social enterprise.

The paper summarises thoughts on how key elements of the 20-minute neighbourhood concept might be reimagined in the rural context in terms of a “living well locally” approach, and key points relevant to the issues discussed in this note are described below.

While the 20-minute neighbourhood concept aims to create high density neighbourhoods where population numbers make it economically viable for services to locate, the “living well locally” approach aims to create small housing developments which promote cooperative living as a form of service provision (e.g. SMART Clachans). The “living well locally” approach also aims to create high density supply/demand networks (e.g. food and energy networks, circular economies) where resources are used closer to production source, as well as invest in micro/social enterprise tailored to dispersed populations.

The “living well locally” approach expands on the 20-minute neighbourhoods aim of planning for shared community spaces (such as parks and multi-functional community hubs) and electric vehicle (EV) door to door Amazon-like deliveries, by also supporting mobile services which in themselves create shared community space e.g. libraries, hairdressers and the Screen Machine.

In terms of digital services, the “living well locally” concept takes a more custom approach by addressing market failures in connectivity through supporting small scale, non-fibre dependent broadband infrastructure and network innovations such as LoRaWAN systems as a pre-requisite to rollout of digital services. This contrasts with the more centralised infrastructure favoured in 20-minute neighbourhoods. Similarly, “living well locally” seeks to improve connectivity between existing settlements through targeted infrastructure improvements (eg bridges, ferries), as opposed to the creation of new, more centralised housing.

Furthermore, while 20-minute neighbourhoods attempt to improve existing public and active transport networks, the “living well locally” approach seeks to overcome continuous market failure in the provision of ‘point to point’ public transport. Although the two approaches deal with different circumstances, both seek to use Mobility Hubs and Demand Responsive Transport (DRT) initiatives (including community transport initiatives) as part of their solution.

As private car transport is especially vital to rural and island communities, “living well locally” takes a softer approach to the minimisation of car-related infrastructure, compared to 20-minute neighbourhoods. Both approaches heavily favour a transition towards EVs, however.

Smart Villages / Smart Clachan

The Smart Village is a rural approach for cooperative living and service provision, which aims to use enhanced digital connectivity to create a “vibrant, creative and sustainable rural economy”.

A variant on the Smart Village concept which is of relevance to the sparsely populated areas of Scotland is the ‘Smart Clachan’ – the first of these has been built at Rubha Bhuailt on South Uist. The concept is a small development which incorporates affordable, energy efficient homes, alongside shared amenities such as workspace and outdoor space, which reduces the need for travel and helps to foster a “community-led, cooperative ethos”. The incorporation of connected hubs, similar to a scheme in Ireland is said to “bring local areas back to life and provide a lifeline for those relying on phone and internet connectivity”.

The concept also provides opportunity to address rural challenges related to lack of public transport connectivity and the high cost of car ownership by providing shared EVs.

Connected Hubs

In 2021, the first Connected Hubs were launched in Ireland. Connected hubs are community-based hubs which enable people to book workspace and aims to “maximise the economic opportunity of remote working”. These hubs have been delivered as part of Irelands Rural Development Policy 2021-25 which involves optimising digital connectivity to create hubs where people can work locally and provide an opportunity for businesses to expand into rural areas.

There are 315 hubs in Ireland, many of which are in rural areas. A specific example highlighted by Glass et al (2020) is a hub opened in 2019 in Arranmore.

The Island faced a significant depopulation challenge amounting to a reduction of its population by 40% over a 20-year period. Following anecdotal evidence that newcomers had left due to their inability to support their employment due to insufficient digital connectivity, research by the local community council indicated that lack of employment opportunities were a key barrier to re-attracting former residents, and that a high-speed broadband connection could offer mitigation by enabling remote working.

Providing workplaces and video-conferencing facilities for islanders and visitors, the hub set up to assist the island’s move to a more technological workforce in a bid to attract families and young professionals.

Industries and service provision were improved through providing an ‘Internet of Things’ project for the island, enabling the use of sensors on the island, for example to monitor fisheries.

Medical provision has been improved through:

- Sensors aiding in elderly care, through alerting carers or family when there is a noticeable change in activity.
- Teleconferencing facilities in the GP surgery enabling remote consultation, and hence reducing travel to the mainland for appointments.

Longer term impacts on population trends are yet unknown. Efforts to increase population will reportedly depend on an integrated approach to develop new residences to address housing shortages.

However, response from the community and in terms of business applications were reported to be positive. The hub was also reported to attract 'digital nomads' who are able to stay in on-site accommodation for two to three weeks.

In line with challenges raised by O'Brien (2023) in connection with the wider roll-out of rural hubs, the project is not for profit and the volunteer team are challenged by the volume of enquiries. O'Brien (2023) notes that this was causing similar facilities not being used to their full potential. The paper concludes that the "volunteer-led model is not sustainable; hubs need knowledgeable support" while ensuring a people centric approach fostering a sense of community.

2.2.5.4 Summary of Key Points

- The digital divide, including issues around poor connectivity, high cost due to limited competition and lower levels of digital adoption present a key barrier to policies to promote rural vibrancy through opportunities afforded by improved digital connectivity.
- Key intervention success factors relate to:
  - Availability of financial resources.
  - A holistic consideration of the full range of drivers and constraints when developing repopulation initiatives rather than focusing on a single issue such as connectivity.
  - A bottom-up approach, rooting such initiatives in the communities.
  - Targeting integration as well as attraction of new arrivals.
  - Enabling economic diversity.

3. Fieldwork

This section reports primary research undertaken to explore the research questions. This work included three separate research activities:

- Interviews with academic experts.
- Two focus groups.
- A questionnaire survey.

Key findings from these are summarised in Sections 3.1, 3.2 and 3.3, respectively.

3.1 Academic Interviews

3.1.1 Approach

This section summarises the findings of engagement with five academics carried out as part of the research, including four interviews and one written response. The academics worked within UK universities and have research records and interests that are relevant to the research questions. It summarises the findings against the research questions.

It should be noted that the views reported in this note represent informal responses and general views grouped by theme and should not be attributed to a single individual, who are not named or in any way identified. As these are summaries of conversations and assertions from the interviewees, “was said to”, “was noted that” etc should be taken as implicit if not directly written.

3.1.2 To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses?

The consensus is that location decisions of residents and businesses, and the sustainability of local communities and businesses, are not simple functions of the availability and quality of transport or digital connections. Instead, interviewees noted that choices are influenced by a range of considerations. A range of choice factors were discussed, including employment and higher education opportunities, and access to services, such as healthcare and schools. The availability of suitable housing stock, land ownership matters, and development constraints, and less tangible factors such as landscape attractiveness or community and social capital were also noted to influence location decisions.

For businesses, suitable buildings or land, business networks, and the degree to which they can network with distant sources of information, and local development advocacy, all have impact. Therefore, policy response needs to go beyond just improving transport networks.

One interviewee noted that connectivity improvements have led to a gradual shift in business locations over the past 50 years. Ignoring activities based upon local resources (farming, fishing, forestry etc) and service industries which serve the local

population (garages, retail etc), the rest of the rural economy has become more footloose. This was first driven by improvements in physical mobility, and more recently and selectively, by digital connectivity.

A key recent trend for residential location choice relates to workplace flexibility enabled by remote working. This has expanded commuting patterns, so that there are only small parts of the Scottish mainland which remain functionally disconnected from urban economic centres. Anecdotal evidence noted that estate agents were receiving more enquiries from people looking to move to remoter rural areas while working remotely during the pandemic, and that there are significant numbers of professionals who live in rural parts of Aberdeenshire, for example, and commute weekly to London, and further afield.

The discussions explored modelling that investigated the determinants of rental and sales values using housing market data for England and Wales. This showed significant correlation between transport connectivity and house prices, which is confirmed by substantial evidence from academic sources. However, better physical accessibility was regarded less as a determinant of location choice as it increases the search area people are considering; there is a large distance-decay effect in the interdependency between transport connectivity and the size of the search area. Most people move within 10 km of their former residence, with the proportion reducing with distance. At 50-100km from the original location the number of moves is very small. As a caveat, these findings may be less applicable in remote rural areas because the housing market is very small. Accessibility was also noted to have a more noticeable impact on population retention than it has on location choice.

Limited work has been done to assess digital connectivity's role in household location. However, the Department for Digital, Culture, Media and Sport's (DCMS) Superfast Broadband Programme - State Aid Evaluation Report (2020) found that the UK Government's £2.6bn investment in superfast broadband in 'commercially unviable' areas of the UK increased the value of homes sold in programme areas by about 1.2% between 2012 and 2019.

Interviewees' views varied regarding to what extent the quality of digital connectivity constrains location choice in Scotland's remote rural areas, noting a gap in evidence and that available data is qualitative or anecdotal. One interviewee noted that based on qualitative evidence collected, a study exploring how remote working influenced migration trends in Ayrshire, Argyll and Bute and Dumfries and Galloway did not find evidence to confirm the initial expectation that broadband connectivity was a problem. The impression was that digital connectivity was generally fairly good.

3.1.2.1 Summary of Key Points

- Household location choices are influenced by a range of factors including employment and education opportunities, access to services, housing availability, land ownership and development constraints, landscape attractiveness, community, and social capital.

- Business location choices are affected by availability of suitable buildings or land, configurations of business networks, and the degree to which businesses have the ability to network with distant sources of information and local development advocacy. Therefore, policy response needs to go beyond just improving transport networks.
- Location decisions vary substantially for different businesses. For SMEs and the service sector, businesses and households are often collocated.
- Connectivity improvements (initially physical and more recently digital) have led to a shift in business locations, with more flexibility for many industries. However, service industries rely on proximity to population and industries such as farming, fishing and forestry need to be close to those resources.
- Remote working has meant that there are only small parts of the Scottish mainland which remain functionally disconnected from urban economic centres, with anecdotal evidence from the pandemic suggesting that more people are considering moving to remote rural areas and working remotely or commuting longer distances on a less frequent basis.
- Evidence suggests a significant correlation between transport connectivity and house prices, although better connectivity tends to increase the search area rather than determining location choice, and has more impact on retention than location choice. These findings may be less applicable in remote rural areas because the housing market is very small.
- There is limited evidence on the role of digital connectivity in household location, although there is evidence that investment in superfast broadband in 'commercially unviable' areas increases house prices.

3.1.3 To what extent are Digital Connectivity and Physical Mobility (i.e. transport) substitutable?

Information on the trade-off between digital and transport connectivity is often anecdotal. It was generally felt that digital connectivity and physical mobility are not directly substitutable, although there is some level of substitutability. Substitutability was noted to be impacted by equality of access, demographics, and other factors. These factors are explored further in section ·.

For businesses it was noted that there are various manufacturing industries in which there is no substitutability. However, some manufacturing has benefited from changes in logistics, which enabled light manufacturing to move into remoter areas and small towns. At the other extreme are online service industries, which theoretically can operate in any location with fast internet connection. Most economic activities were viewed combining physical mobility and digital connectivity in a variety of ways. Even businesses that carry out most activities through digital communication methods it was considered that there remains some need for face-to-face contact, both with other members of the team, and external business contacts. Availability of suitable employees was also noted to influence location choice.

Results from the 2021 Census for England and Wales show homeworking increased substantially from 10% in 2011 to 30% in March 2021. However, it was noted that these figures highlight that even towards the end of the COVID-19 pandemic around 70% of jobs were not done from home, suggesting that in a significant number of jobs physical presence cannot be substituted. It was also noted that the Annual Population Survey (APS) showed a much smaller increase.

Interviewees noted that there is a general pressure among businesses to have at least some people on site, with employers requiring people to attend the office once or twice a week. While remote working has enabled business to cut space and cost, research in England suggests that the post-pandemic idea that people would live in the Lake District for example and work in London has not materialised. Even for those who can mostly work remotely, an occasional office visit can be challenging from a remote rural location. This tends to increase the relative attractiveness of areas for remote working which are accessible in terms of physical mobility (road, rail, and air).

In Scotland, interviewees noted that for employees with remote and hybrid work arrangements that only require physical presence occasionally, some remote and islands communities become possible locations. For example, research into remote working in Tiree included a Local Authority accountant who needed to attend the office only every couple of months. However, such exceptions were facilitated by reasonably priced air connections to Glasgow and/or London. Places that have such connections such as Tiree can be better connected than remote places dependent on poor road or rail connections. Interviewees noted that occupations that require hybrid working become impossible to hold in many remote communities for example in the Hebridean Islands.

Interviews highlighted a huge shift towards telephone, online, and other forms of digital consultation for health services during the pandemic. Research on remote service delivery effectiveness has been reported in medical journals. Interviewees noted an expectation that in the next few years many health services will be conducted digitally, although some consultations in person will still be necessary. There was a view that some medical and care services, especially for the elderly and frail people, cannot be provided remotely, and equality issues were raised relating to connectivity and ability to access remote care.

Substitutability of education services was also discussed and was considered possible to some extent. In some remote areas, digital delivery in secondary education was said to have improved subject choice, allowing pupils to participate in specific subjects remotely rather than having to relocate. Qualitative research undertaken in Tiree recorded islanders who participated in remote higher education courses for example at the University of the West of Scotland.

Regarding commercial services, it was noted that supermarkets and some big online retailers deliver to almost all locations. However, it was suggested that for remote rural locations this is likely to be at a loss, and so relies on the goodwill of suppliers. It was considered possible that drones could play a role in deliveries in the future. There are, however, commercial services which require in person presence, including in hospitality.

Even where digital can substitute for physical connectivity in principle, this does not always resolve limitations in very remote rural locations. Interviewees highlighted that internet connectivity in such areas is constrained by cost and emphasised that providing high speed digital infrastructure in remote areas is very expensive. In addition, similar legal and logistical constraints including access to land, mean that locational constraints for digital connectivity are likely to be comparable to those for physical connectivity.

The interviews highlighted that many assets in remote rural locations relate to natural capital, including highly valued scenic areas, which cannot be experienced remotely. Levels of awareness of areas of natural beauty was said to have increased markedly. Many residents in remote areas are using Airbnb, and this has supplemented incomes. Bookings in general are facilitated by digital tools, this includes food hospitality, tours of scenic areas, and sporting activities like shooting and fishing.

It was noted that much of the data and research on choice mechanisms and digital substitutability comes from market research surveys, such as IPSOS Mori polls. However, understanding choices requires data on people's aspirations and how they relate to their behaviour. This was reported to currently represent a gap in research data availability.

3.1.3.1 Summary of Key Points

- Information on the trade-off between digital and transport connectivity is often anecdotal. It was generally felt that digital connectivity and physical mobility are not directly substitutable, although there is some level of substitutability. Substitutability was noted to be impacted by equality of access, demographics and other factors.
- Most economic activities require a combination physical mobility and digital connectivity. Even where remote working is usually sufficient, some degree of face-to-face contact is generally seen as necessary. Availability of suitable employees also influences location choice.

- Homeworking has increased substantially in recent years, but towards the end of the COVID-19 pandemic around 70% of jobs were not done from home, suggesting that in many jobs physical presence cannot be substituted.
- There is pressure for many hybrid workers to come into the office at least some of the time. Even for those who can usually work remotely, an occasional visit to their office can be a challenge from a remote rural location. Qualitative research did report evidence of hybrid working in some remote communities; however, this was generally in locations with reasonably priced flight connections to Glasgow and/or London.
- There was a shift to remote healthcare provision during the pandemic and this is expected to continue, although consultations in person will still be required in some circumstances. Equality issues were raised relating to connectivity and ability to access remote care. Considerations in decisions to move to remote service delivery include practitioner efficiency, medical outcomes and cost savings.
- Education was seen as substitutable to some extent. In some remote areas, digital delivery in secondary education has improved subject choice without pupils having to relocate and there are examples of remote participation in higher education courses.
- Although supermarkets and some big online retailers deliver to almost all locations, in remote rural locations this is likely to be at a loss, relying on the goodwill of suppliers. It was considered possible that drones could play a role in deliveries in the future. Some commercial services such as hospitality require in person presence.
- High speed digital infrastructure has many of the same locational constraints as physical connectivity, including cost, legal, and logistical constraints.
- Many assets in remote rural locations relate to natural capital, including highly valued scenic areas, which cannot be experienced remotely. This presents an opportunity to supplement incomes, and digital tools can facilitate bookings.
- Much of the data and research on choice mechanisms and digital substitutability comes from market research surveys, however understanding choices requires data on people's aspirations and in-depth data relating them to their behaviour, representing a gap in research data availability.

3.1.4 How does this differ by activity, demographics and geography?

There has been a population uplift in remote rural areas in 2021. However, interviewees noted a gap in hard evidence on composition and the potential contribution of different groups to the longer-term sustainability of remote communities.

Research gaps also extended to the availability and timeliness of detailed spatial information. Census data is a standard source, however, for Scotland, the latest census data has not yet been released. In England and Wales data was collected

during the pandemic (2021), and it was noted that at the time many people had to work from home.

Existing population trends were said to be caused by a combination of factors whose relative importance varies by group. Household location decisions are linked to life-stage considerations, for example. Interviewees noted that trends for migration of school leavers who choose higher or further education to the Central Belt and other University towns/cities are well documented. There was a view that the establishment of the University of Highlands and Islands (UHI) offering distance learning, may have reduced this to some extent. Often a graduate's first job and home are close to their place of higher education. A proportion of professionals who come from rural families choose to return home, and some interviewees noted that this share may be increasing and that returners do so earlier.

With respect to digitally enabled location decisions, interviewees highlighted that locating very remotely from the workplace is a personal preference, constrained by factors including family considerations, the need for all household earners to find suitable accessible employment, and access to services (schools, health, retail, etc). These constraints vary, depending on characteristics such as age, family size, life stage, and personal preferences. One interviewee noted that newcomers to remote rural areas often have children above school age, so they do not need a school nearby. This was countered by remote rural pensioners moving to small towns which offer easier access to health services and sheltered housing. There was a view that islands (apart from those with short ferries or bridges) are generally less affected by these trends.

The interviews also mentioned 'digital nomads', another digitally enabled trend in migration. This group uses digital technology to work remotely while moving from place to place. There was an impression that digital nomads were present in the Western Isles and elsewhere in the Highlands, however, there is no data to better understand the magnitude of this trend.

The interviews highlighted that the scope for digitally enabled remote working depends on employment type. The Organisation for Economic Co-operation and Development (OECD) produced a report on Teleworking in the COVID-19 pandemic: Trends and prospects, which presents evidence on how remote working rates during COVID-19 varied with employment types. There is likely to be a continued drive for remote working in higher qualified and higher earning jobs, resulting in location choices that are less tied to employment location. Remote rural areas are attractive to higher earners, able to pay premium rates in the housing market, making the affordable housing shortage more acute for those with fewer qualifications who wished to stay in the area.

There was a view that the demographics for remote working tend to be well-qualified and to some extent established, and aged 30+. By contrast, there was an impression that most people who leave remote rural locations are young and looking for qualifications or work. Young leavers are also seeking an immersive experience in terms of developing networks and socialising after work, for example. This was

viewed as positive in principle, and remote working was viewed as a means of encouraging people to return to rural areas in greater numbers, rather than stopping them leaving in the first place.

There is also a spatial disparity in the ability to work from home. While Census headline figures indicate 30% of jobs in England and Wales were done from home in March 2021 this was in the region of 60+% in London and the south-east but only around 10% in rural Wales.

The interviews discussed research into how remote and hybrid working impacts the geography of where people live and work. The research objective was to understand post-COVID-19 trends. Based on quantitative data from Census and APS, levels of remote working in England were higher around London and the south-east of England. Lower levels were recorded along the east coast of England, south of the Humber, where the labour market structure is not suited to remote working. The project team analysed census data to identify the key predictors of remote working levels and the proportion of workers engaged in remote working. The proportion of workers in professional and managerial roles and the qualification levels of the workforce were the two main statistical determinants. Remote working seems to be favoured by people in places that are already relatively wealthy.

One interviewee also noted that it is less likely that someone already living in a remote rural area will develop the skills required to start working remotely.

One interview explored work on demographic and spatial variability in internet use by the Consumer Data Research Centre (CDRC), who have developed a small area Internet User Classification highlighting demographic differences in internet use. For example, poor quality broadband in rural areas means that people use the internet for shopping or banking but not for telecommunication and conferencing. There are other areas that are very well connected, for example coastal resorts, where people typically go to retire. People in these areas have good connectivity but they do not tend to use the internet as much.

There was a view that different locations attract different demographics for relocation, with very scenic or picturesque places such as Tiree tending to attract an older wealthier demographic. These newcomers were also more likely to get involved with the communities, although there can at times be tension with existing populations in terms of priorities. By contrast there are some places in Dumfries and Galloway, such as Newton Stuart, which have lower than average house prices and tend to attract working people from a wider age and income range. Recent research has shown that many of these newcomers come from England and are attracted by affordable rural housing. The research also provided anecdotal evidence that perceptions of social care and free prescriptions in Scotland were factors in some relocation decisions.

It was noted that house prices are to some extent an indicator of geographic differences in the popularity of locations. Property prices have increased across the board including in more deprived locations such as towns in the three Ayrshires,

potentially because those areas started at a lower baseline. It was noted that the demographic profile of people moving to these areas was unknown. Census data, when available, will provide insights on population trends by geography.

It was noted that accessing recent systematic and long-term research on rural communities in Scotland is a challenge. In recent years there has been a focus on international migrants, in particular EU accession migrants. It was suggested that not enough work is done on internal migration in particular on young people aged 16 to 35 and location choice, and on what decisions they would make if connectivity was better. Young people were said to present as a hard-to-reach group and investment of resources is required to ensure they are represented in surveys and studies in general.

3.1.4.1 Summary of Key Points

- Scotland's rural population increased in 2021, however there is an evidence gap in how this increase is composed and how it may affect the long-term sustainability of remote communities.
- There are also gaps in the availability and timeliness of detailed spatial information, particularly noting the delay in Scotland's Census.
- Many young people from remote locations leave for further or higher education, although this has been reduced to some extent by the distance learning offering from the UHI. For many graduates, their first job and home are close to their place of education, although some from rural families choose to return home, and this may be happening more often and earlier.
- Locating very remotely from the workplace is a personal preference, constrained by factors including family considerations, and access to employment and services. These constraints vary, depending on characteristics such as age, family size and life stage, and personal preferences.
- Some examples of typical incomers to rural areas are families with children above school age, 'empty nesters' whose children have left home, and 'digital nomads' who work remotely while moving from place to place. Typical leavers include pensioners moving to small towns for access to health and social care. These trends are less clear on the islands.
- Potential to work from home varies by employment type and tends to favour higher qualified and higher earning jobs. This makes remote rural areas attractive to higher earners, increasing house prices and exacerbating the affordable housing shortage for those with fewer qualifications who wish to stay in the area.
- Home working tends to be more possible for older people who have already done in person work, while leavers tend to be younger people who are new to the workplace or seeking opportunities such as education, developing networks, and socialising after work. Remote working has more potential to encourage people to return to rural areas than to stop them leaving.

- There is a spatial disparity in the ability to work from home, with data suggesting significantly lower levels of home working in rural areas.
- Analysis of key predictors of remote working levels found the two main statistical determinants were the proportion of workers in professional and managerial roles and the qualification levels of the workforce. Remote working is more common in places where people are well off.
- It can be difficult for people living in a remote rural area to develop the skills required to start working remotely. However, quality of life benefits may attract people who already have those skills to move to a remote area.
- There are demographic differences in internet use. Poor quality broadband in rural areas can mean that people use the internet for shopping or banking but not for telecommunication and conferencing. Some coastal resorts where people typically go to retire have good connectivity, but often the demographic groups in these locations do not tend to use the internet very much.
- Different locations attract different demographics for relocation. Scenic or picturesque places tend to attract an older wealthier demographic who are more likely to get involved with the communities, although there can at times be tension with existing populations in terms of priorities. Places with lower-than-average house prices tend to attract working people from a wider age and income range, many of whom come from England and are attracted by affordable housing in a rural place. Perceptions of better social care and free prescriptions in Scotland can also be factors affecting relocation from England.
- House prices are an indicator of geographical differences in location decisions and have gone up across the board. The demographic profile of people moving to rural areas is unknown, although Census data, when available, will provide more detailed insights on population trends by geography.
- There has been a focus on international migration and more work is required to understand internal migration, particularly on factors affecting household location decisions for young people, who can be a hard-to-reach group.

3.1.5 To what extent do the above variables impact on depopulation occurring within communities?

Connectivity improvements were viewed to have pushed depopulation to remoter areas, as documented in the EAG's 2021 and 2022 reports. One contribution stressed the importance of differentiating between rural locations: population has grown in accessible rural areas, and growth has even "overheated" in some peri-urban areas.

One interviewee noted that in Scotland population and jobs are concentrated in the Central Belt and most other areas are geographically peripheral. Scottish research into remote and hybrid working and how they impact on where people live and work therefore focussed on population sustainability. Analysis of mid-year population estimates indicated that many datazones that had previously experienced decline experienced growth in 2021.

Post-COVID-19 trends were explored by qualitative research including consultation with leaders of community trust, development projects, and businesses, to explore how remote working influenced migration trends in Ayrshire, Argyll and Bute, and Dumfries and Galloway. The research also included workshops in places like Kirkudbright and Newton Stewart, and interviews in Tiree. Qualitative data from this suggested the population in these locations had increased slightly since COVID-19, though some caution should be applied to these findings due to the small numbers involved. For example, there is a datazone just east of Kirkudbright which was one of the top ten datazones by percentage population growth, however. population increased by only 27 people.

There was consensus that in some remote areas, community sustainability is a challenge. One interviewee noted CDRC research that assessed the vulnerability of small areas. The research looked at food retail locations and the availability of online slots for delivery for example. Together with the internet user classification work this fed into a picture of local vulnerability called the Priority Places Index. Local services are moving online, for example bank branches, particularly in areas where populations are low. There is increasing disparity where rural areas lose services but do not have sufficient internet speeds to access services remotely. Deliveries may also be less available or cost more money. This disadvantages rural communities.

Data since COVID-19 shows a small increase in second residences in more rural areas, but no evidence of wholesale moves to rural areas. It was noted that this will not address challenges around young people moving from those areas, and that just attracting people who are able to work from home will not build balanced communities.

Even where recent trends have reversed the population decline, population aging is a key challenge due to the younger population moving away. Interviewees highlighted a huge challenge around staffing social care and healthcare roles in rural Scotland and remote working cannot address this. Informal care that might have been provided by families is often not an option where people's adult children live in more urban areas. Population aging results in lower birth rates, exacerbating the problem. As a result, dependency ratios are high.

The impact of changes in rural age structures was discussed in the context of the viability of rural farming. One interviewee noted that farming in remote rural areas tends to be small scale; often it is subsistence farming with people holding a second job to supplement incomes. The average age of a rural farmer in Scotland is 60, illustrating the challenges attracting young people. Farmers can be relatively affluent in central Scotland but in ultra-remote areas, the sector is struggling. Markets in general can be more efficient if they are online and in theory digital connectivity could improve access to relevant buyers. However, given the age structure of the current farming population digital competence is a limiting factor for the use of digital tools like market transaction apps.

Government support of agriculture is changing towards a more environmental focus. This will require increased measurement to establish if environmental objectives are being achieved, and online tools are likely to play a role. For example, World Heritage status is being sought on behalf of the Flow Country, restoring peatlands is probably more important to environmental outcomes than reforestation. Requirements to record data related to environmental change is problematic for people who are less digitally enabled.

There was a view that digital connectivity is a necessary, but not sufficient condition for the farming sector to thrive and attract young people to stay in rural areas. Lack of supply of local people could make it difficult for these industries to remain viable. It was noted that many young people would not consider living in an area where a certain level of digital connectivity is not available. However, it was also noted that a vast improvement in digital connectivity may work against the rural foundation industries, through in-migrations of skilled higher income occupations and their impact on the housing market. Access to affordable housing was widely recognised as a key constraint for young people who wish to stay in the area and work in those industries. It was considered that these housing related constraints would require a policy response.

Anecdotally there was some evidence that in-migration could help local industries find employees, for example where couples move together and spouses pick up lower paid jobs in the rural economy, while their partner works remotely or in a local better paid job. However, while digital infrastructure could help rural business viability in some ways, the interviews suggested it is difficult to see how digital connectivity improvements on their own could become a solution.

Rural services sustainability in general was highlighted as a key challenge. Anecdotal evidence noted a village in the north-west with a population of about 500, with only one child of primary school age. In such remote communities there is a shortage of working age families with children, and hence a lack of peers. Such communities are at risk of school closure, and this becomes a disincentive for families to move there. Teachers are shared between schools and school provision becomes a complex logistical problem. In remote areas there is a lack of flexibility with respect to substituting lost services or gaps in connectivity, for example through using different methods of transport.

When looking at population trends in rural Scotland, there was a wider view that it is difficult to disentangle the effect that poor or expensive connectivity has on attracting and retaining population from the impact of constraints on affordable housing provision. The combination of the pandemic, an increase in tourism, and second home ownership has created a housing crisis.

Connectivity enabled population movements were said to have impacted upon the age structure more widely in rural Scotland. The conversations highlighted that people often move to remoter rural areas to retire or buy second homes, attracted by facilities such as golf courses, and that the pandemic has often been a catalyst in such locational decisions. Anecdotal evidence from estate agents also suggests people were buying properties without looking at them, although no research has been done on this specifically, or on its interactions with location choice. The interviews also noted a shortage of rentals for people moving to the area because property owners can make more money on Airbnb.

Qualitative research in Ayrshire, Argyll and Bute, and Dumfries and Galloway suggested in-migration might be dominated by older age groups (50+). Often they came from cities in England and had considerable housing equity. They were often looking for somewhere rural in Scotland with a good sense of community. Many participants had previous familiarity with Scotland through frequent visits, and were flexible with respect to specific location, that is they searched the internet for available properties and their location choice was guided by availability. This trend pre-dates COVID-19 but was said to have increased since. This has exacerbated challenges around housing affordability in rural areas. Population trends in Arran for example have been inverted during COVID-19. The island is a short ferry journey from the mainland and has a moderate connection to Glasgow. People moving there tend to be wealthier but older, and able to afford properties at higher prices than many working-age people in local jobs.

Qualitative evidence from stakeholders who contributed to research suggested that some locations faced difficulty attracting and retaining healthcare workers. For example, on Tiree there is a care home which operates at half capacity due to staffing issues. In some locations there was evidence that local hotel or B&B capacity was taken up by care workers who cannot afford to live locally. In other places such as Arran, health and social care workers who cannot afford to live on the island were reported to commute, though this is only possible because the island is a relatively short ferry journey from the mainland. Qualitative evidence from places such as St Andrew's and Pittenweem suggested employees in the care sector live in more affordable old mining villages nearby. However, this is less possible on islands, where house prices tend to be high throughout.

Evidence from consultations also highlighted severe staffing issues in hospitality, for example the Auchrannie resort in Arran reported only being able to open one of its restaurants due to labour supply issues. In-migration of people from eastern Europe has declined in more recent years and this was said to have exacerbated the situation. They were often younger, with no intention of staying and therefore more tolerant of a range of living conditions, whereas local workers more often have family considerations.

However, a lack of affordable housing is not the only barriers faced by young working age people looking to move to rural areas. In response to speakers highlighting the importance of more housing, for example, a young participant in a seminar highlighted that houses do not feed people. The evidence is anecdotal but there is a need to provide high quality employment opportunities. Interviewees noted that this does not necessarily mean high paid jobs but good quality employment that pays the right wages based on qualifications. A policy response across multiple Government departments, providing good quality employment, housing, nursery care, and schools was said to be required to address the depopulation issue.

Research undertaken around 15 years ago, at a time when Scotland's population was set to fall below 5 million, showed that young people were moving to London or the south-east of England to progress their careers, often referred to as the escalator effect. Once upskilled, they often do not return. It was noted that to some extent this still exists.

The UHI may have been helpful in retaining and attracting young people in some areas, although no systematic research is available. Remote learning also has potential to reduce outmigration. However, keeping young people from leaving should not necessarily be the objective of initiatives to address depopulation challenges. Interviewees noted that in ultra-remote areas, young people who have school qualifications expect to leave. Some young people return having acquired skills at university or in another setting. Often this is motivated by a connection to the land, and local ways of living such as crofting and the Gaelic language.

There was an impression that COVID-19 and the lockdowns acted as a catalyst for people who were already thinking about coming back to return. However, it was noted that they would often not be able to without the support of their families and access to social connections. There was an impression that people do want to live in many places currently suffering depopulation but cannot because of issues around housing availability and affordability.

There is evidence that poor physical accessibility is making people more likely to leave. Better digital accessibility could mitigate this and help retain people. There are some examples of such successes in remote places. An example was given of a small town on the east coast of Scotland. 30 years ago it was dilapidated but in a very scenic location, then artists started moving in, the community became active and set up a community broadband scheme. Despite the absence of good public transport connections, the town has been regenerated over a 30-year period and it is now a very active community, with local businesses and a mobile cinema.

Community broadband provision was also noted on Tiree, where a community-run scheme provides a broadband service to approximately 250 subscribers. However, such successes depend on communities' social capital and will not work everywhere. Interviewees also noted equality issues around IT capability/expertise, in rural areas digital uptake was said to be far lower. Demographic composition and the composition of the rural labour market were said to represent a barrier.

Some interviewees noted that connectivity is a huge challenge for ultra-remote areas in Scotland. In remote areas, digital infrastructure is present and digital connectivity is not necessarily a problem, although businesses seeking a dedicated line may face long delays. However, in ultra-remote areas in the north-west of Scotland, for example, lack of connectivity is a significant barrier to in-migration, and it was noted that given the expectation of households and businesses this acts as a disincentive to stay.

Evidence from the interviews also highlighted regional differences in transport provision in the north of Scotland. In the east of the region, it is possible to travel to hospital and back by public transport in a day. In the north and the west of the region this is not feasible, therefore requiring travel by private car which is a limitation for many people.

Interviewees noted that while some statistical data on migration patterns exists and some research into challenges in rural Scotland is available from HIE's Highlands and Islands Enterprise (2022), there is insufficient qualitative data on the various trends in migration, within Scotland, UK wide and from overseas to provide an overall image. Further research is also required to improve understanding of young people's location decisions. A time series study following young people leaving school and recording what happens to them could provide high quality data forming a more holistic picture of their location choices.

3.1.5.1 Summary of Key Points

- Connectivity improvements have redrawn the boundary of remoteness, pushing back depopulation to more peripheral areas.
- Population in accessible rural areas has grown in recent years, in some cases substantially so. Depopulation has been pushed back to remote and in some cases very remote areas.
- Scotland's spatial characteristics see population and economic activity in Scotland concentrated in the Central Belt, with the rest of the country geographically more peripheral. This makes population sustainability a key consideration in the analysis of migration patterns.
- Distance to food retail locations, combined with limited availability or high costs of online deliveries were highlighted as a challenge to the sustainability of remote communities.
- Closure of local services has led to an increasing disparity between accessible and remote areas, as internet speeds in some remote areas are insufficient to fully access services online.
- COVID-19 has led to small population increases in many areas that previously experienced population decline, including some remote and Island communities. However, there is no evidence that remote working has led to large-scale moves to rural areas. It was considered unlikely that this alone could build balanced communities, or counter-act the exodus of young people.
- Natural population aging, the outflow of young people and lower birth rates result in unbalanced age structures in many remote areas. This creates greater care needs while reducing the scope for informal care provided by families. Difficulties staffing social care and healthcare roles in rural areas compound the problem.
- Challenges recruiting young people into rural foundation industries such as farming were reported. Less capacity of the workforce in these sectors for taking advantage of digital innovation, such as market transaction apps or to complete environmental measurement requirements associated with Government support, reduces their competitiveness.
- Good digital connectivity is necessary but not sufficient to attract young people to remote areas. However, where digital connectivity is improved to a standard which enables substantial remote working, this could adversely impact on staff availability for rural foundation industries and the care sector through reducing availability of affordable housing. Reduced in-migration of people from Eastern Europe has added to staffing challenges in these sectors.
- Sustainability of rural services such as education was highlighted as a key challenge, with sharing of staff resources across locations requiring complex logistics.

- Access to housing is a key barrier which has been exacerbated by an increase of in-migration of people with comparatively high housing equity prompted by the pandemic, an increase in tourism and second home ownership.
- There is anecdotal evidence that digital delivery in further education is enabling some young people stay in the area. An interest in local ways of living and culture may also have encouraged more people to return or do so earlier. Returners often depend on family support due to the cost of living.
- The depopulation issue will require a trans-sectoral policy response, considering access to jobs, housing schools and childcare as well as transport and digital connectivity.
- Examples of successful communities are linked to community capacity to drive change, and this varies between locations. This includes initiatives to set up community broadband.
- There is a distinction between remote and ultra-remote areas. In the latter, it is often impossible to travel to hospital and back by public transport in a day and lack of connectivity, both digital and transport are a dis-incentive to stay.

3.1.6 Can potential future access interventions consider the above variables in the context of proactively supporting attraction and retention within locations of Scotland which have experienced, or are experiencing, population decline?

Interviewees noted that there is no definitive answer. There was a view that the reversal of population trends across many rural areas in Scotland has coincided with gradual improvements to road, rail, air, and ferry infrastructure, increases in car ownership, and improvements in vehicle performance and reliability.

It was also noted that in the north of Scotland there is an infrastructure gap and hence the ability of localities to take advantage of economic development opportunities between the east and the west. Although there are other areas that are similarly remote, the west and the north are showing the most obvious symptoms of decline.

As one example in the north of Scotland, transport links in the County of Sutherland have been improved over time, particularly in the east due to the Kessock, Cromarty Firth, and Dornoch Firth Bridges, enhancing economic activity in those townships. Economic activity declined in areas that were bypassed after the new infrastructure was introduced.

Another example noted in the interviews is the NC500 travel route, a 500-mile scenic route between Inverness and John o'Groats and returning to Inverness along the north and west coasts. It was noted that interior towns missed out on economic benefits provided by the popularisation of the route and show signs of neglect. This highlights trade-offs in the context of physical infrastructure improvements.

Digital connectivity was also viewed as playing a role in location decisions. The DCMS evaluation cited above evidenced the link between superfast broadband and higher demand for housing, which may suggest that if superfast broadband was rolled out alongside good services, then this could impact positively on attracting populations.

There was also a view that both physical and digital improvements can help enable young people brought up in remote areas return. In this context, it was regarded as important to recognise that economically active young people often live in two geographical spaces, one rural and one urban, and travel between them.

However, interviewees noted that connectivity improvements can possibly mitigate but not reverse existing trends of population decline in remote areas. There is substantial academic consensus that these trends cannot be reversed. Connectivity influences various factors that contribute to population decline.

It was also widely acknowledged that the deep-seated drivers of depopulation are complex. Connectivity improvements alone were viewed as unlikely to overcome rural depopulation issues unless other drivers of depopulation such as fertility rates, lack of employment opportunities, and availability of housing are addressed. It was also acknowledged that Scotland's rural areas are very diverse, geographically, socially, and culturally, and this presents challenges to creating policy that fits every location.

There was a view that regional policy makers and politicians have favoured transport infrastructure investments (especially trunk roads and railways) because they are easy to implement without involving the local community and sometimes local government, except in terms of consultation, because they are easy to cost, and produce very visible outcomes. There was a perception that such projects are easier to manage than those which involve local actors or beneficiaries (whether public, private or third sector).

As a further challenge to policies targeting improved remote area viability through connectivity improvements, it has long been recognised that improvements to transport infrastructure may have negative effects upon remote communities/economies, where better access to services in more accessible locations undermines the competitiveness of businesses in the periphery.

Access to basic services is widely acknowledged as a key determinant of local population trends and migration. The relationship was described as complex and recursive, since service providers such as local Councils and the NHS adapt the distribution of their provision in response to population trends, but their response may in turn affect subsequent household location decisions.

Remoteness is partly defined by physical infrastructure; the Scottish Government definition considers the ability to access certain services in 30 minutes, but in some ultra-remote areas journeys to key services such as supermarkets can take up to 2 hours by public transport, or an hour by private car.

Some interviewees noted that when it comes to access to services it is the local feeder roads which are important, not the trunk roads and railways which are the focus of transport policy. However, there was also a view that it can be difficult to separate the respective roles of the feeder road network and strategic connections in remote areas. It was noted that regeneration of these areas will not happen without significantly more people coming to take advantage of the natural capital of these areas either in their work or in enhancing their wellbeing and strategic transport links play a key role in this. If the journey to Edinburgh takes 6 hours, people may be inclined to seek a less remote location.

Public transport has been evidenced to present a challenge in remote rural areas. The Scottish Government provides free bus travel for 16-22 year olds and over 60s. However, there was a view that given the nature of the labour market in rural areas, which has a high proportion of lower paid and sometimes seasonal jobs, there is a need to provide affordable public transport for all working age people. Policy initiatives should consider how to provide a good public transport system that is affordable for all age groups.

Network coverage was also viewed as a challenge in rural areas. Community transport schemes providing on demand transport, for example through a minibus service, do exist. However, it was noted that this is a postcode lottery, with provision often skewed towards wealthier communities who have greater capacity to self-organise. There was a view that digital connectivity could be a mechanism that could help arrange alternatives to public transport.

Transport affordability may impact on working populations even in jobs where remote working is possible. Research evidence notes adverse impacts on mental health and people may not wish to work remotely all the time. However, the cost of transport makes hybrid working unaffordable for some people in remote areas. Policy could support alternatives for example through providing shared digital workspaces locally.

Interviewees highlighted that challenges around transport costs affect delivery of goods as well as personal transport. Some areas of the Highlands are not classed as UK mainland and incur extra delivery charges. The Islands are even more disadvantaged. HIE (2016) reports work investigating minimum incomes needed to lead a comfortable life in remote rural Scotland. This showed that the more remote your residential location the more minimum income you need. Transport costs including for deliveries and fuel were a factor. It was noted that there are also inequalities around quality, for example of fresh produce.

There was perception that in many rural places public transport connectivity has deteriorated. It was noted that the trend towards privatisation of public transport services and centralisation of services go back to the economic crisis in 2008. The crisis also affected funding for community transport services. In the north of Scotland local services such as local hospital facilities and maternity hubs have closed. However, public transport services have not improved to enable access to alternative facilities. As a result, residents in some areas were said to be reliant on emergency transport services when they need to get to the nearest hospital in Inverness. Policies from multiple Government departments is required to solve these problems. In some locations there is also a sense that planning public transport provision does not sufficiently account for the needs of the economically active.

With respect to digital connectivity, it was noted that despite published evidence that a high proportion of the country have digital connectivity, it must be remembered that there is a small proportion that is not covered. The evidence is often anecdotal. For example, there are locations just 35 miles north of Inverness that do not have good digital connectivity. While many areas have a fibre optic connection, there are pockets that do not. Some households depend on copper wire connections to make the link to the fibre optic network. Download speeds in such areas at times fall short of the legal minimum. Connectivity issues became evident in some households during the COVID-19 lockdowns. Connections often struggled with two or three people working in the same household to get adequate connectivity. Research gaps were noted in understanding how connectivity in rural areas holds up under several concurrent demands.

There are some locations which operate community broadband as an alternative to commercial providers. Satellite internet connections could also provide an alternative and are being made in some ultra-remote areas but the cost for households is high compared to a standard connection.

3.1.6.1 Summary of Key Points

- There is evidence that transport improvements such as the construction of the Kessock, Cromarty Firth, and Dornoch Firth Bridges have enabled the local area to take advantage of economic opportunities, while areas outside the reach of those improvements have declined.
- The drivers of population are complex and some such as fertility rates and shortages in housing availability cannot be addressed by connectivity improvements.
- Unintended consequences of investment in strategic connectivity can include ‘pump effects’, whereby improvements dis-proportionately benefit locations which were well connected to begin with.
- There were disparate views regarding where to best focus transport investment to support the viability of remote places with arguments for both investment in the strategic and the local feeder network. In some areas their functions overlap.

- Transport affordability is a challenge for those in lower paid employment, while most working age people are currently not covered by free bus travel. A fair approach considering affordable public transport for all group requires consideration.
- Network coverage is a challenge in rural areas and while community transport does exist, this tends to be skewed towards wealthier communities. Digital connectivity could help arrange alternatives to public transport.
- The cost of transport can make hybrid working unaffordable for some people in remote areas and can impact working populations even where remote working is possible, due to the mental health impacts of isolation. Shared digital workspaces in remote areas could mitigate this.
- Transport costs can also impact delivery of goods, with additional delivery charges for islands and some areas of the Highlands. Evidence suggests a higher minimum income is required to make life comfortable in remote areas.
- There is a perception that public transport connectivity has deteriorated in recent years, and funding for community transport has decreased. This, combined with closures of local healthcare facilities, has left some residents reliant on emergency transport services for access to hospitals. An integrated solution is required to address this.
- Public transport provision does not always account for the needs of the economically active.
- Anecdotal evidence suggests that a small proportion of the country still does not have digital connectivity, with download speeds falling short of the legal minimum at times. The return of some young people during the COVID-19 lockdowns highlighted that connectivity is not always able to support several concurrent demands. This was highlighted as a gap in the research.
- Community broadband can be an alternative to commercial providers, as can Starlink connections although these can be expensive.

3.2 Focus groups

This section details the findings from two focus groups that aimed to explore the research questions.

Two focus groups took place; one with those who have recently moved from an urban area to rural Scotland; and one with those that currently live in urban area and are looking to move to rural Scotland soon.

3.2.1 Methodology

Respondents were categorised into one of two groups.

- **Group 1: 7 respondents recently moved from an Urban to Rural area.** Glasgow was the most common origin with London, Norfolk and Staffordshire also cited. All rural destinations were classed as 'remote rural areas' with a population of less than 3,000, such as Stewarton, Kames, Ardallie, Dalcross, and Pitlochry.
- **Group 2: 9 respondents currently live in an urban area but are looking to move to rural Scotland soon**. Current residences were typically in large cities such as Edinburgh, Glasgow, Aberdeen and Inverness. Respondents were generally not set on particular villages to relocate to but cited Perthshire and rural Inverness as preferred regions.

Each group lasted approximately 90 minutes. Transcripts were made of each group and this formed the basis of the analysis. Quotes have been used to illustrate points where possible.

3.2.2 Focus Group Findings

3.2.2.1 Moving Home: Benefits

In *Group 1*, respondents emphasised a changing lifestyle and perspective as their primary motive for relocation. The Covid-19 pandemic highlighted the importance of good air quality, ownership of land and proximity to the coast and countryside. Those in *Group 2* echoed these priorities, particularly those with children as they look to raise their children in a safe and natural environment.

> *"I just love the simplicity of life where I am." (Group 1)*

Budget was also a significant determinant of location with several individuals identifying better value for money in rural areas. One respondent repeatedly emphasised that council tax was utilised more effectively in rural Scotland and contributed to better upkeep of green spaces.

> *"I could not believe what they get for their money compared to what I get or what I did get in Glasgow. It's like … and I used to work for Glasgow Council too, so I feel rotten saying that and I know it's different and more challenging in Glasgow, but it's like what I get for my council tax here, it's not just the bins emptied. Flowers getting planted and grass getting cut. In Glasgow they don't cut grass" (Group 1)*

> *"like I can get a house with a garden in Ormiston for the price of my flat in Edinburgh" (Group 2)*

The community aspect of rural life was also highlighted. Respondents in both groups posited that living in an area with a low population means less traffic, fewer disruptions, and more peace and quiet. They also noted a better relationship with local neighbours and a greater sense of community.

"I think rural places have got a lot more of a sense of community." (Group 1)

"There's more a sense of community than living in an urban area." (Group 2)

Several respondents in *Group 2* had grown up in a rural area and cited a return home as one of their motives for relocating. Some respondents were concerned at how their current urban area had changed demographically and viewed rural life as an escape from increasing urbanisation.

3.2.2.2 Moving Home: Concerns

Across both focus groups, snow and adverse weather during the winter months was highlighted as a concern. Respondents from *Group 2* expressed concern over attending regular hospital appointments and accessing emergency care. Those in *Group 1* acknowledged that connectivity could be a barrier if it was poor.

Group 2 were worried about how existing residents would respond to an outsider attempting to join the community. While *Group 1* downplayed this concern, they revealed that once in a community, they struggled with everyone knowing their business.

3.2.2.3 Transport and Connectivity

Respondents in *Group 1* revealed that living rurally can cause reliance on cars as the primary mode of travel. Infrequent public transport, primarily on bus services, is the main cause of transport connectivity concern. However, respondents in *Group 2* suggested that public transport could be available if needed, even if direct routes are uncommon.

"That's what I forgot about. That you can't just get a bus every 10 minutes." (Group 1)

"I would probably be making more journeys by public transport." (Group 2)

Access to supermarkets poses a problem even for *Group* 1 respondents that do have an available car. One respondent indicated that their closest supermarket was seven miles away, with another respondent positioned 40 miles from their nearest large supermarket. However, these distances do not deter those who live rurally from maintaining in-person shopping habits. Most respondents in *Group 2* were not concerned about the challenges of shopping and suggested that a weekly big shop could be supplemented with quick visits to local shops and farm goods.

"Unless you've got a car you have to plan." (Group 1)

"These little shops are really the lifeblood of the community." (Group 2)

Whilst shopping is a challenge in practice, most respondents suggested that they are well-serviced by schools and healthcare facilities. Schools are within a driveable distance and are serviced by a dedicated school minibus. One respondent explained that although they do not have a dedicated GP, the local community has a plan in place in case of an emergency. While some respondents in *Group* 2 expressed

minor concern over the logistics of attending in-person medical appointments, others suggested that rural waiting times for appointments could be lower.

> *"I think I would be better off if I had to go to a doctor and I was in a village." (Group 2)*

Some respondents in *Group 2* identified that they would likely have to drive more to support their children's activities. However, these respondents reached a consensus that they were not concerned about the distance from friends and family. One individual in *Group 1* expressed that separation from loved ones can become a challenge when attempting to access local employment since there is no one you can fully trust to support childcare.

3.2.2.4 Digital Connectivity

There was a stark dichotomy between *Group 1* and *Group 2* over their perceptions of digital connectivity in rural areas.

Group 2 emphasised that a strong internet connection would be necessary for work and were optimistic that this would be achievable. Most respondents had gained confidence from stories of government grants being awarded to improve internet speed and providers such as Starlink elevating connectivity to a level higher than what can be achieved in some urban areas.

> *"When it's a bit quieter, a bit more rural, there's not so many people trying to fight for that internet connection." (Group 2)*

However, *Group 1* were unanimous in putting across the challenges they face with phone service and internet connection. Most respondents have resorted to purchasing a booster for their internet connection or paying for Sky Glass. This is a particularly salient issue for respondents that rely on a strong internet connection for working from home. Moreover, these purchases represent costs that were not anticipated prior to moving to rural areas.

> *"It's frustrating because people phone you and they think you're ignoring them, but you actually can't hear them." (Group 1)*

Respondents in *Group 1* also highlighted the challenges of poor digital connectivity for older people. Since rural areas tend not to have physical banks or other professional services, transactions are predominantly handled online. Most respondents believe that this can present a challenge for older people without smartphones and can contribute to loneliness as digital connections are not a suitable replacement for in-person conversations.

> *"I think online is great but I still like to talk to somebody." (Group 1)*

> *"People are losing the art of conversation." (Group 1)*

3.2.2.5 Employment

Respondents in *Group 1* varied in occupation, with some individuals retired, others in management positions in the business and energy sector, and a couple of individuals holding local jobs in teaching and dog boarding. The respondents in management positions admitted that career progression is likely more limited in rural areas due to travel into their central offices taking over three hours. A promotion would require more frequent travel which could undermine their work/life balance.

> *"Future progression is limited without any more moves." (Group 1)*

> *"There's less promotion opportunities now because everything is really aimed at the central belt." (Group 1)*

Group 2 also varied in profession. Respondents included an author, chartered surveyor, project manager, carer, and workers in the agricultural, recycling, and banking compliance sectors. Most respondents were certain that they could maintain their current jobs after moving due to the opportunities of remote or hybrid work.

> *"I think I would travel less if I moved more rural because I would be more organised." (Group 2)*

In *Group 1*, a consensus emerged that everyone wants to support local businesses. However, some respondents identified that when it comes to renovating homes or undertaking maintenance, it can be challenging to find local workers who are willing and available to undertake a job.

3.2.2.6 Housing

Most respondents in *Group 2* identified that moving into a rural area could be challenging due to the shortage of houses on the market and the unexpected higher prices associated with low supply. One respondent suggested that they would want to trial living in the area for a few months before committing completely to the move.

> *"I would maybe rent somewhere for three to six months, just to make sure that this is something I want to do." (Group 2)*

Respondents in *Group 1* explained that this problem is exacerbated by the 'closed shop' nature of rural communities. Several of the respondents struggled to purchase their house, with one respondent revealing that the houses they placed bids on were repeatedly sold to local people instead.

> *"They were really keen to keep local people in local properties." (Group 1)*

3.2.2.7 Summary of Key Points

To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses?

- Pull factors motivating moves to rural areas identified by the focus groups related to quality of life and community aspects of rural life. For returners the presence

of family also played a role. Push factors from urban areas included demographic changes and an escape from increased urbanisation.

- Challenges noted by recent movers included concerns about disruption due to bad weather in winter months, as well as a lack of privacy. People looking to move were concerned about response from the existing community.
- People in rural areas acknowledged that poor connectivity could act as a barrier. Connectivity challenges were noted in connection with excessive car reliance and low public transport frequency, especially for bus.
- Access to supermarkets was limited, with residents in rural areas quoting distances to the nearest supermarket up to 40 miles. The importance of local and farm shops in supplying local residents was emphasised.
- Quality of schools and healthcare services was generally perceived as high, although some participants expressed concerns over their ability to travel to in person appointments. The role of the local community in developing contingency plans for medical emergencies was noted.
- Lack of childcare and absence of nearby family in this context were cited as a barrier to employment.
- Participants who had recently moved to rural areas unanimously noted challenges with standard internet and mobile phone connectivity. These resulted in additional costs to pay for satellite connections or boosters, as well as impacting on their ability to work effectively. Challenges accessing digital services and increased loneliness were noted as risks for old people.
- Career progression was perceived as more limited for those working remotely.
- Challenges over accessing housing were noted by recent movers and those looking to move. Prioritisation of locals in house sales was noted as a factor.

3.3 Survey Responses

3.3.1 Methodology

An online market research panel, Dynata Global UK Ltd, were commissioned to complete the online survey, they invited a representative profile of their panellists to complete a 10-minute questionnaire. The survey was live between the 7th and 19th June 2023.

Overall, 752 surveys were completed across Scotland. Table 3-1 shows the proportions achieved for age, gender and urban / rural residency compared to census data. Survey outcomes were within 2% of the census data. Table 3-1 shows the level of variation using 95% confidence limits for a view shared by 50% of the population.

Table 3-1: Demographic Profile

Quota	Census	Survey	Confidence Interval (+/-)
Age: 18 to 34	27%	26%	7.0%
Age: 35 to 54	32%	34%	6.1%
Age: 55+	41%	39%	5.7%
Gender: Male	48%	45%	5.3%
Gender: Female	52%	54%	4.9%
Gender: In another way / prefer not to say	---	1%	---
Residency: Urban	82%	71%	4.2%
Residency: Rural	18%	28%	6.8%
Residency: Don't know	---	1%	---
Totals	**4,454,919**	**752**	**3.6%**

Source: National Records of Scotland: Mid-2021 Population Estimates

56% of residents who completed the survey were working, 18% not working, and 26% retired. Appendix A shows the spread of responses for each of the 32 Council areas, compared to census data.

Data was analysed using IBM SPSS software (Statistical Package for Social Sciences). Statistical significance testing was completed at the 95% confidence level. Where results are reported as different between sub samples, this means the differences are significant at the 95% confidence level.

3.3.2 Frequency of Working from Home

Table 3-2 shows that of the 420 residents who worked, 50% worked from home at least one day a week, with 26% working from home four or five days a week.

Table 3-2: Frequency of working from home

Frequency	Age 18-34	Age 35-54	Age 55+	Total
Five days a week or more	11%	21%	20%	17%
Four days a week	12%	8%	9%	9%
Three days a week	6%	13%	4%	9%
Two days a week	15%	9%	5%	10%
One day a week	6%	4%	3%	4%

Occasionally, less than one day a week	10%	8%	8%	9%
Never, I do not work from home	40%	38%	53%	41%
Base (4 respondents did not provide their age)	**144**	**192**	**80**	**420**

3.3.3 Current Location

The questionnaire first sought to understand the distribution of respondents across the various types of areas to live in. This is shown below in Table 3-3. As may be expected, the most common response was within an urban area, which accounted for 46% of overall respondents, compared to 26% for small towns, and 29% for rural areas.

Table 3-3: Location of residence

Current location	Proportion
Large urban area (population of 125,000 and over)	22%
Other urban area (population between 10,000 and 124,999)	24%
Accessible small town (population between 3,000 to 9,999 and a drive time of LESS THAN 30 minutes to an urban area)	19%
Remote small town (population between 3,000 to 9,999 and a drive time of MORE THAN 30 minutes to an urban area)	7%
Accessible rural area (population below 3,000 and a drive time of LESS THAN 30 minutes to an urban area)	20%
Remote rural area (population below 3,000 and a drive time of MORE THAN 30 minutes to an urban area)	9%
Don't know	1%
Base	**752**

Three-fifths (61%) owned their home (with or without a mortgage), 31% were in rental accommodation, and 8% lived with parents or in a room in a shared house.

Table 3-4: Breakdown of living situation of respondents.

Residence status	Age 18-34	Age 35-54	Age 55+	Proportion
Own my home outright	7%	20%	73%	37%
Own my home with a mortgage	26%	41%	8%	24%
Part-own through shared ownership	1%	1%	0%	1%
Live with parents/family (paying rent or rent-free)	19%	2%	1%	7%
Rent from a local authority / housing association	14%	17%	11%	14%
Rent a house from a private landlord	21%	13%	6%	12%
Rent a flat/apartment from a private landlord	12%	3%	0%	4%
Rent a room in a shared house	2%	0%	0%	1%
Other (please specify)	0%	0%	1%	1%
Base **7 respondents did not provide their age**	**198**	**255**	**292**	**752**

3.3.4 Highly rated features of where they currently live

Respondents were asked to rate the quality of various aspects of living where they currently live. Green or open spaces nearby (86%), Access to towns and cities (77%), Mobile phone connectivity (77%) and Broadband \ internet connectivity and reliability including on a smartphone (75%) all scored very highly overall. Full results are presented in Table 3-5, sorted in descending order of total of “very good” and “good”.

Table 3-5: Rating of features of where they currently live

Feature	Very Good	Good	Neither Good nor Poor	Poor	Very Poor	Don't know
Green or open spaces nearby	49%	37%	8%	5%	1%	0%
Access to towns and cities	31%	46%	13%	7%	2%	0%
Mobile phone connectivity	28%	49%	13%	8%	3%	1%
Broadband \ internet connectivity and reliability including on a smartphone	27%	48%	14%	6%	5%	1%
Access to my place of work	27%	47%	15%	6%	3%	2%
Broadband \ internet speed including on a smartphone	25%	49%	15%	5%	5%	1%
Schools in the area	23%	50%	13%	4%	2%	9%
Access to shopping and amenities	23%	41%	17%	14%	4%	0%
Low levels of crime	20%	42%	21%	10%	5%	2%
Access to higher education	21%	40%	19%	8%	3%	8%
Access to hospitals for regular healthcare	19%	41%	23%	12%	4%	1%
Being close to friends and family	21%	39%	21%	10%	8%	1%
Access to emergency healthcare	20%	40%	22%	13%	4%	2%
Access to places for leisure	17%	40%	21%	15%	5%	1%
Low levels of anti-social behaviour	20%	37%	23%	12%	6%	2%
Having a frequent and reliable public transport service	18%	36%	16%	17%	12%	2%

Having an affordable public transport network	18%	34%	19%	17%	9%	3%
Availability of homes in the area	9%	33%	29%	19%	6%	5%
Affordability of homes in the area	9%	30%	25%	21%	10%	4%
Options for childcare / childcare providers	8%	29%	20%	6%	3%	34%

Base: all respondents (n=752)

However, there were some significant differences when comparing those that live in urban and rural areas: whereas access to towns and cities, mobile phone connectivity, broadband and internet connectivity, and broadband and internet speed all have over 80% of urban respondents classifying the quality as good, for rural respondents, none of these features have over 60% classifying them as good.

Table 3-6a: Highest rated features in URBAN Areas (either good or very good)

Highest rated features	Urban	Rural
Access to towns and cities	84%	57%
Mobile phone connectivity	83%	60%
Green or open spaces nearby	82%	95%
Broadband \ internet connectivity and reliability including on a smartphone	81%	60%
Broadband \ internet speed including on a smartphone	80%	59%

Apart from the obvious green and open spaces the highest rated attributes in rural areas were low levels of crime and low levels of anti-social behaviour (all over 75%) compared to less than 60% of those living in urban areas.

Table 3-7b: Highest rated features in RURAL Areas (either good or very good)

Highest rated features	Urban	Rural
Green or open spaces nearby	82%	95%
Low levels of crime	56%	77%
Low levels of anti-social behaviour	50%	75%

3.3.5 Low rated features of where they currently live

Following on from the previous section, this section considers respondents' lowest rated aspects of living where they currently live. For simplicity, the "very poor" and "poor" categories have been combined into a single poor category in Table 3-8.

One of the biggest issues identified by residents of rural areas was the poor-quality levels of frequent and reliable public transport services, with 52% classifying this as poor, compared to only 19% of respondents in urban areas. Affordable public transport, availability of homes, and access to shopping and amenities were also rated considerably worse in rural areas when compared to urban areas. However, anti-social behaviour was identified as more of an issue by residents of urban areas than those living in rural areas.

Table 3-8: Poorly rated features split by location of residence (either poor or very poor)

Lowest rated features	Urban	Rural
Affordability of homes in the area	31%	34%
Having a frequent and reliable public transport service	19%	52%
Having an affordable public transport network	20%	42%
Availability of homes in the area	22%	33%
Access to places for leisure	18%	26%
Low levels of anti-social behaviour	22%	9%
Access to shopping and amenities	14%	29%

3.3.6 Will consider a move to rural areas

Further questions in the survey gauged attitudes towards moving home and identifying which respondents would consider moving to a rural area. Table 3-9 shows the proportion of respondents who would consider moving to rural areas and those who would only move to an urban area. Overall, around half (48%) would consider moving, but only 10% would consider moving to a rural area.

Table 3-9: Respondents potential moves

	Age 18-34	Age 35-54	Age 55+	Proportion
Would consider moving to a rural area	9%	13%	10%	10%
Would only move to an urban area	67%	39%	18%	38%
Don't know	4%	4%	2%	3%
Definitely will not move	21%	45%	71%	49%
Base (7 respondents did not provide their age)	**198**	**255**	**292**	**752**

This is investigated further in Table 3-10, where the answers are split by where the respondents currently live.

Table 3-10: Respondents potential moves split by current area of residence

	Proportion
Currently live in an urban area and would consider moving to a rural area	4%
Currently live in a rural area and would stay in a rural area	6%
Currently live in an urban area and would stay in an urban area	33%
Currently live in a rural area and would consider moving to an urban area	5%
Don't know	4%
Definitely will not move	48%
Base	752

Some of the key findings are as follows:

- 10% would consider having their next home in a rural area (20% of those who would ever move).
- 4% of respondents live in an urban area and would consider moving to a rural area (8% of those who would move).
- 6% live in a rural area and would stay in a rural area (12% of those who would move).
- 5% live in a rural area and would consider an urban area (10% of those who would move).
- Age made no substantial difference to those who would consider moving to a rural area.

  67% of 18-34-year-olds would only consider moving to an urban area and 71% of respondents aged 55+ would not move home.

3.3.7 Criteria for moving home

Respondents were asked about their top five criteria for moving home, with the same aspects considered as in Table 3-5. Below in Table 3-11, a breakdown by current location of urban and rural and respondent age is provided for each criterion.

Table 3-11: Top five criteria for choosing a new place to live

Criteria	Age 18-34	Age 35-54	Age 55+	Urban Residents	Rural Residents	Total
Green or open spaces nearby	31%	47%	55%	42%	57%	46%
Affordability of homes in the area	48%	42%	38%	42%	40%	42%
Low levels of crime	39%	40%	39%	41%	36%	39%
Being close to friends and family	34%	35%	38%	36%	36%	36%
Access to shopping and amenities	34%	31%	39%	34%	37%	35%
Low levels of anti-social behaviour	23%	37%	37%	34%	32%	33%

Access to hospitals for regular healthcare	22%	21%	47%	28%	40%	32%
Having a frequent and reliable public transport service	22%	23%	41%	29%	33%	30%
Access to towns and cities	32%	27%	22%	26%	27%	27%
Broadband \ internet connectivity and reliability	23%	25%	26%	24%	27%	25%
Access to emergency healthcare	17%	16%	26%	20%	20%	20%
Access to places for socialising, leisure, and culture	27%	16%	19%	22%	15%	20%
Having an affordable public transport network	20%	23%	17%	21%	17%	20%
Availability of homes in the area	19%	20%	17%	18%	21%	19%
Broadband \ internet speed	31%	26%	3%	18%	19%	18%
Access to my place of work, when not working from home	17%	22%	16%	21%	11%	18%
Schools in the area	26%	18%	4%	17%	10%	15%

Mobile phone connectivity	12%	12%	9%	11%	10%	11%
Returning to a place I grew up in	4%	8%	5%	6%	6%	6%
Access to higher education	10%	5%	1%	5%	4%	5%
Options for childcare / childcare providers	10%	4%	0%	5%	1%	4%
Base	**198**	**255**	**292**	**531**	**212**	**752**

Five of the top 6 most important criteria were the same for urban and rural residents: green or open spaces nearby; affordability of homes in the area; low levels of crime; being close to friends and family; and access to shopping and amenities. Similarly, green or open spaces nearby; affordability of homes in the area; low levels of crime were important criteria for respondents irrespective of their age.

Some of the key findings where views differed by group are as follows:

- Access to hospitals for regular healthcare and access to greenspaces were considered more essential by rural than by urban respondents.
- Access to their place of work, when not working from home was more important to urban than to rural residents.
- Respondents aged 55+ had a higher priority for access to hospitals for regular healthcare (47%) compared to other age groups (22% of 18-to-34-year olds and 21% of 35-to-54 year olds).
- Respondents in the 35-54 and 55+ age groups also valued access to greenspaces more highly than those aged 18-34.
- Similarly, respondents aged 55+ felt a frequent and reliable public transport service was a priority compared to younger age groups (41% of 55+ year olds compared with 22% of 18-to-34 year olds and 23% of 35-to-54 year olds).
- Younger age groups placed higher value on broadband /internet speeds with 31% of 18-34 year olds, 26% of 35-54 year olds and 3% of over 55 year olds identifying this as one of their top criteria. They also placed greater emphasis on the importance of affordability of homes (48%), availability of schools (22%) and childcare options (10%) than older demographics.
- 37% each of respondents aged 35-54 years old and 55+ gave a priority to low levels of anti-social behaviour, more than younger people aged 18-34 years old (23%).
- Access to towns and cities was a higher priority for 18-to-34 year olds (32%) compared with respondents aged 55+ (22%).

Men and women agreed on five of the top six criteria that respondents felt were most important when choosing a place to live. The only significant differences were:

- More women than men felt being close to family and friends was important (40% and 31% respectively).
- More men than women felt low levels of anti-social behaviour was important (38% and 29% respectively).

3.3.8 Expectations of living in remote rural areas

Table 3-12 shows the proportion of respondents who agree with various statements about remote rural living split by current area of residence, with records for “strongly agree” and “agree” combined. Table 3-13 shows similar information but for

respondents who disagree with the statements. This highlights some aspects where those who currently reside in urban areas may perceive rural living differently to those who currently reside in rural areas.

Whilst both current urban and rural residents' opinions generally align on most issues, urban residents perceive mobile phone and internet connectivity, access to towns and cities, continuing current employment, access to higher education, childcare provisions, and schools to be a bigger problem than rural residents. On the other hand, rural residents identified a greater problem with housing availability than urban residents.

Looking at the totals, only 33% of respondents thought it would be easy to travel via public transport, compared to 68% who thought it would be easy to travel by car, which highlights the perception with public transport in rural areas. Another concern of respondents was employment, with only 17% of respondents thinking it would be easy to find new employment opportunities and 16% thinking there are sufficient employment opportunities.

Table 3-12: Respondents who agree with statement about remote rural areas (sorted by total agree)

	Urban Residents	Rural Residents	Total
It would be easy to travel to towns and villages by car	66%	72%	68%
Houses in remote rural areas are better value for money compared to urban areas	53%	52%	53%
I would have no concerns about schools in a remote rural area	42%	43%	42%
Mobile phone connectivity is sufficient to meet my needs in remote rural areas	38%	51%	42%
It would be easy to continue my current employment in a remote rural area (if in employment)	38%	51%	41%
Broadband / internet connectivity is sufficient to meet my needs in remote rural areas	37%	49%	40%
I would have no concerns about access to higher education	33%	39%	35%
It would be easy to travel to towns	35%	28%	33%

and villages by public transport			
There would be enough options for entertainment and socialising in a remote rural area	29%	33%	30%
There are enough houses to choose from in remote rural areas	33%	23%	30%
I would have no concerns about access to healthcare, including emergency healthcare	28%	32%	29%
I would have no concerns about childcare provision in a remote rural area	29%	29%	29%
It would be easy to find new employment in a remote rural area (if in employment)	19%	13%	17%
There are enough employment opportunities living in a remote rural area	16%	15%	16%
Base	531	212	752

Table 3-13: Respondents who disagree with statement about remote rural areas (sorted by total disagree)

	Urban Residents	Rural Residents	Total
It would be easy to find new employment in a remote rural area (if in employment)	53%	57%	54%
There are enough employment opportunities living in a remote rural area	50%	53%	51%
I would have no concerns about access to healthcare, including emergency healthcare	47%	42%	45%
It would be easy to travel to towns and villages by public transport	41%	52%	44%
There are enough houses to choose from in remote rural areas	39%	49%	42%
There would be enough options for entertainment and socialising in a remote rural area	44%	35%	41%
It would be easy to continue my current employment in a remote rural area (if in employment)	42%	29%	39%
I would have no concerns about access to higher education	33%	20%	30%
Mobile phone connectivity is sufficient to meet my needs in remote rural areas	31%	22%	28%
I would have no concerns about childcare provision in a remote rural area	31%	20%	28%
Broadband / internet connectivity is sufficient to meet my needs in remote rural areas	29%	23%	28%
I would have no concerns about schools in a remote rural area	26%	17%	24%
Houses in remote rural areas are better value for money compared to urban areas	16%	15%	16%
It would be easy to travel to towns and villages by car	14%	13%	14%
Base	531	212	752

3.3.9 Acceptance of digital technology

As the previous question highlighted potential concerns about public transport connectivity from respondents, the subsequent question regarding use of digital technology is particularly pertinent. Table 3-14 gives the proportion of respondents

who found specific uses for digital technology acceptable or unacceptable. Whilst most respondents found it acceptable to use digital technology for shopping (minimum across shopping categories 67%) and watching sport/entertainment (74%), spending time with family and friends was deemed less acceptable, with only 43% of respondents classifying it as such.

Table 3-14: Acceptability of online or telephone as a replacement for face to face contact

Column heading	Acceptable	Not Acceptable
Watching sport/entertainment	74%	8%
Shopping for household technology such as a TV, fridge/freeze	73%	12%
Shopping for clothes	69%	14%
Shopping for food	67%	20%
Work	54%	18%
Having medical appointments	49%	33%
Accessing education	46%	25%
Spending time with family and friends	44%	36%

Base: all respondents (n=752)

Table 3-15 gives a breakdown of respondents who found specific uses for digital technology acceptable by age group. Spending time with family and friends was the only interaction where there was no significant difference in the proportions who felt it was acceptable to replace face to face with online or telephone, irrespective of age group.

Table 3-15: Age groups accepting online or telephone as a replacement for face to face contact

	Age 18-34	Age 35-54	Age 55+	Total
Watching sport/entertainment	85%	76%	64%	74%
Shopping for household technology such as a TV, fridge/freeze	79%	76%	67%	73%
Shopping for clothes	84%	71%	58%	69%
Shopping for food	80%	67%	58%	67%
Work	68%	62%	37%	54%
Having medical appointments	55%	48%	45%	49%
Accessing education	61%	50%	32%	46%
Spending time with family and friends	45%	47%	38%	44%
Base	**198**	**255**	**292**	**752**

Base: all respondents (n=752)
Excludes 7 respondents who did not provide their age

Some of the key findings where views differed by age group are as follows:

- More 18-to-34 year olds than those aged 55+ were likely to feel it was acceptable to interact online or on the telephone than face to face, irrespective of the purpose of the interaction, with the exception of spending time with family and friends.
- More 35-to-54 year olds than those aged 55+ were likely to feel it was acceptable to interact online or on the telephone than face to face for all interactions with the exception of medical appointments.
- More 18-to-34 year olds than 35-to-54 year olds were likely to feel it was acceptable to interact online or on the telephone than face to face when: watching sport or entertainment, shopping for clothes or food, and accessing education.

3.3.10 Summary of Key Points

To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses?

- Local amenities rated as good or very good by residents in their areas, included green or open spaces nearby (86%), access to towns and cities (77%), mobile phone connectivity (77%), broadband/internet connectivity (75%), access to place of work (74%) and broadband/internet speed (74%).
- A larger proportion of rural residents rated low levels of anti-social behaviour (by 25 percentage points), low levels of crime (by 21 percentage points) and vicinity to greenspaces (by 13 percentage points) in rural areas to be either good or very good.
- A higher proportion of rural residents rated public transport frequency and reliability (by 33 percentage point), public transport affordability (by 22 percentage points), access to shopping and amenities (by 15 percentage points) and availability of homes (by 11 percentage points) in their area as poor or very poor.
- 10% of respondents said they would consider having their next home in a rural area.
- A higher proportion of those who would consider moving to a rural area already live in rural areas, with 12% of those who would move living in a rural area and intending to stay in such areas and 8% of those who would move living in urban areas and considering to move to a rural area.
- The top five criteria for choosing a new place to live were vicinity to greenspaces (46%), affordability of homes (42%), low levels of crime (39%), being close to friends and family (36%) and access to shopping and amenities (35%).
- There were differences in the location choice factors considered by urban and rural residents. Respondents were asked to state their top five criteria for choosing a new place to live. While there was substantial alignment on many factors, the following criteria were quoted by a substantially higher proportion of rural than of urban residents, vicinity to green or open spaces (by 15 percentage points) and access to hospitals (by 12 percentage points). Urban residents rated access to place of work more highly (by 10 percentage points).
- On many issues perceptions of living in remote rural areas aligned between urban and rural respondents. However, a higher proportion of urban respondents perceived mobile phone connectivity (+13 percentage points), continuing current employment (+13 percentage points), internet connectivity (+12 percentage points), access to higher education, childcare provisions, and schools to be a bigger problem than rural residents. A larger proportion of rural residents felt housing availability is likely to be a problem in remote rural areas (by 10 percentage points).

- A higher proportion of respondents aged 55+ rated access to frequent and reliable public transport as a priority, higher by 19 percentage points compared with those aged 18-34 and by 18 percentage points compared with those aged 35-54.
- Younger age groups placed greater importance on broadband and internet speed, with 31% of 18-34 year olds, 26% of 35-54 year olds and only 3% of those aged 55+ rating this as one of their top criteria. There was little difference in the value different age groups placed on the reliability of the connection.
- Access to towns and cities, availability of schools and childcare was also more important to those aged 18-34. By contrast older demographics tended to value access to hospitals, access to greenspaces and low levels of anti-social behaviour more highly.

To what extent are Digital Connectivity and Physical Mobility (i.e. transport) substitutable?

- Digital substitution was rated as acceptable or very acceptable high for watching sports and entertainment (74%) and shopping (67%+, depending on commodity).
- Acceptance was less than 50% for medical appointments (49%), accessing education (46%) and spending time with friends and family (44%).
- Respondents aged 18-to-34-year-olds felt it was more acceptable to substitute face to face contact with interactions online or by telephone than those aged 55+, irrespective of the purpose of the interaction, with the exception of spending time with family and friends.
- Remote or hybrid working was more common for those aged 18-54 than for older age groups, with 53% of respondents in work and aged 55+, 40% of those aged 18-34 and 38% of those aged 35-54 saying that they never worked from home. However, exclusive remote working was less common in the 18-34 age bracket. 11% of working respondents aged 18-34, 21% aged 35-54 and 20% of respondents aged 55+ said they worked from home 5 days a week or more.

4. Synthesis of Evidence and Recommendations

4.1 Background

Sparsely populated areas in Scotland are projected to see substantial population decline. Projections outlined in Copus (2018), for example, indicated that sparsely populated areas could experience an overall population reduction by 28% between 2011 and 2046. Differential impacts by age groups are projected to result in substantially increased dependency rates. It is therefore widely acknowledged that creating sustainable communities in these areas will require increased in-migration of young and working age adults and families.

Consideration for policy response:

- Incentivise in-migration of young and working age adults and families in order to create sustainable communities.

Academic experts highlighted specific challenges arising from the spatial distribution of Scotland's population. Scotland's population and economic opportunities are concentrated in the Central Belt. Settlement in the rest of Scotland is much more sparse and often separated by large distances. Community sustainability is therefore a key consideration in shaping a future for many remote localities.

The Scottish Government's definition of remoteness is linked to a 30-minute drive time to the nearest settlement with a population of 10,000 or more. Some sources in the literature further distinguished between remote and ultra-remote areas. In connection with the latter, anecdotal evidence from the academic interviews noted drive times to the nearest supermarket of up to an hour and inability to access key services such as hospital appointments within a day by public transport. The definition of remoteness is not fixed, and over the years connectivity improvements have redrawn the boundary, pushing back depopulation to more peripheral areas.

The research highlighted that policy response to rural depopulation needs to account for differences between accessible rural areas where population has grown in recent years, in some cases substantially so, and remote areas.

Consideration for policy response:

- Consider differences between accessible, remote, and ultra-remote areas in policy response.

4.2 To what extent do Digital Connectivity and Physical Mobility (i.e. transport) impact on location decisions for people and businesses?

Decisions to relocate can be thought of as a two-stage process, with push factors reflecting choice considerations associated with the decision to relocate, and pull factors reflecting considerations informing the choice of a new residential location.

The literature review and fieldwork showed that these stages in the decision-making process are informed by a complex mix of considerations, including property prices

and availability, availability of employment and education opportunities, access to services and amenities, landscape attractiveness and community and social capital. Focus groups emphasised the role of pull factors related to better quality of life and communities.

There was evidence that employment was increasingly regarded as an enabler rather than a motivator and that physical closeness to such opportunities has become less important, at least in some contexts.

The weighting of the above considerations varies depending on factors including the characteristics of the individual, their previous experience and residential location, and their life stage.

Some sources in the literature suggest that for young adults, closeness to friends, peers and families, the cost of housing and closeness to opportunities to shape and progress their career dominated, with 18 to 24 year olds emphasising education, and those aged 25 to 34, employment. The panel surveys showed substantial overlap among the top five location factors stated by different age groups. All age groups rated affordability of homes, low levels of crime, being close to friends and family and access to shopping and amenities among their top five consideration. However, respondents in the 55+ age group regarded vicinity of green or open spaces more highly while access to towns and cities completed the top five for respondents aged 18-34. While housing affordability was a top factor for all age groups, it was more so for younger respondents.

In rural Scotland lack of employment and education opportunities were highlighted as major push factors for these age groups. In this context, widening acceptance of home-based working may offer an opportunity to address a lack of career prospects as a key driver of out-migration. Poor access to services also contributed to decisions to leave, the panel surveys highlighted that availability of schools and childcare mattered more for 18 to 34 year olds and healthcare provision for older age groups. Availability of housing emerged as a major constraint.

More recently in the UK, decisions to move are increasingly informed by the cost of living, particularly for young people.

There is little explicit emphasis on factors related to connectivity in the discourse around relocation decisions. However, while transport and digital connectivity did not emerge as key determinants, evidence from a range of sources including from house price statistics indicated that good connectivity can influence decisions to locate in an area. They also play a role in facilitating access to opportunities relating to a range of other choice factors, including employment and education opportunities, services, and other amenities.

This indirect role of connectivity in people's valuation of locations was also evident in survey responses from Highland and Island residents recorded in Highlands and Islands Enterprise (2022). While a notable proportion of respondents in these surveys identified factors relating to transport and digital connectivity as key in enabling their communities to thrive, issues around availability of housing and

employment received higher scores. This is consistent with the findings of the panel surveys. The surveys also indicated that the importance of public transport frequency was substantially lower for younger age groups. 41% in the 55+ age rated this as one of their top criteria in location choice compared with 22% of 18 to 34 year olds and 21% of 35 to 54 year olds.

However, while good connectivity alone might not be an explicit consideration, its absence is noted in areas where it is poor. Evidence from the focus groups mentioned poor public transport frequencies and high car dependency levels as barriers. In the winter connectivity challenges were said to be compounded by weather conditions. The literature review and academic interviews also emphasised the role played by high transport costs. Maximum acceptable travel distances to key opportunities and amenities were identified as a key constraint on location choice in such areas.

Conversely, improvements in transport and more recently digital connectivity have been shown to expand the search area people consider when choosing a new residential location. On balance good transport and digital connectivity may therefore be regarded as pre-requisite rather than a determinant of location decisions.

Consideration for policy response:

- Good connectivity is considered a pre-requisite to enabling relocation decisions.

It is also note-worthy that individual definitions of ‘good connectivity’ are influenced by personal mode preference and the destinations individuals need to connect to. Reduced car ownership and ability to drive, as well as car scepticism among young people, may present a barrier to rural resettlement initiatives in this context.

4.3 To what extent are Digital Connectivity and Physical Mobility (i.e. transport) substitutable?

Information on the trade-off between digital and transport connectivity was often anecdotal. In many contexts, the review highlighted partial substitutability, with evidence pointing to the potential for the two approaches to be complementary rather than to outright substitution. Substitutability was also noted to vary substantially, impacted by inequalities around demographic factors and the quality of connectivity.

4.3.1 Work

Academics highlighted analysis of census results for England and Wales which evidenced that 30% of jobs were carried out remotely in March 2021. The data was collected at the end of the third national lockdown, and there is therefore an implicit suggestion that in a high proportion of jobs (70%) physical presence is not substitutable. However, there is a substantial proportion that are, and evidence from the literature review suggests that remote working has become more entrenched, in part due to employers' desire to reduce costs and in part due to employees' personal preference. Evidence cited in Felstead & Reuschke (2020) suggested 88% of employees who worked from home during lockdown said that they would like to continue doing so.

With respect to access to employment, there is therefore some suggestion that greater uptake of digital work arrangements since the COVID-19 pandemic could fundamentally change the definition of remoteness. This could help address population push factors related to access to employment opportunities.

However, discussions with academic experts also noted that research at the UK level has produced no evidence that remote working will necessarily lead to large-scale moves to rural areas. This is demonstrated by analysis of census data which noted significant geographical variation. Remote working levels were above 60% in London and the South-East but only 10% in rural Wales. The suggestion is that digitally enabled remote working is more prevalent in areas that are already well connected.

Some insight into possible reasons is offered by data on differences in employment structures in urban and rural areas. This shows that substitutability is higher for skilled jobs in the service sector and for managerial occupations and in lower skilled jobs in goods production, for example.

Details of employment by sector for remote areas reported in Rural Scotland Key Facts 2021 show that sectors less suitable for digitally enabled remote working include accommodation and food services, agriculture, forestry and fishing sectors, which are more prominent in remote areas than elsewhere. It less likely that digitally enabled remote working could play a role in providing greater employment choice for existing rural workforces in these sectors. However, it may facilitate in-migration of working age people and contributions from academic experts noted anecdotal evidence from the pandemic suggesting that more people are considering moving to remote rural areas and working remotely or commuting longer distances on a less frequent basis.

Formulating digital interventions to support this will require understanding of the distribution of related population changes, in order to shape understanding of where to target such a response. Consistent quantitative data enabling such analysis will be available once results from the 2022 census in Scotland have been published.

Consideration for policy response:

- Require detailed understanding of existing spatial patterns of digitally enabled remote working to develop spatial strategy for digital interventions.

ONS (2023) data suggests a strong link between remote working and incomes, with higher income occupations often better suited to remote working. Substantial in-migration enabled by digital remote working could therefore drive substantial change in rural employment and income structures. Based on qualitative evidence from the academic interviews the influx of higher income groups has adversely impacted existing problems around the cost and availability of housing, particularly in areas that offer amenities in terms of natural beauty or rural leisure facilities such as golf courses. In some areas this was reported to add to existing challenges caused by an increase in tourism and second home ownership.

Availability and affordability of housing was highlighted by all three strands of the research as a key constraint for initiatives looking to retain and attract population to remote areas in Scotland. While the evidence offered was qualitative and anecdotal, housing affordability is also substantially impacting on the ability to recruit staff for rural foundation industries such as farming and tourism and for the care sector. Reduced in-migration of people from Eastern Europe has added to staffing challenges in these sectors. There is a need for comprehensive research to investigate these interactions.

There is also some evidence, albeit anecdotal, that a considerable proportion of the influx presents as those in the 50+ bracket whose children have left home, so called ‘empty nesters’. The panel surveys also indicated that while hybrid working is common among younger age groups and acceptance of digital substitution of workplace interactions is higher, exclusive remote working was far less common among those in the 18 to 34 age group. It is unclear whether this is due to the nature of their work or personal preference. However, the evidence would suggest that generic policies specifically aimed at enabling remote working alone are unlikely to build balanced communities, counter-act the exodus of young people, or mitigate concerns over ageing populations in rural areas.

Consideration for policy response:

In intervention design consider impacts of in-migration enabled by digital remote working on:

- local income structures, and hence on housing affordability.
- the viability of rural foundation industries.
- rural age structures.

Wider long-term adoption of home working also requires addressing barriers in terms of knowledge and capacity, regulation, capital costs, and cyber security. In addition, potential impacts on mental health in connection with exclusive remote working were widely recognised.

Academics noted that even for those who can usually work remotely, an occasional visit to their office can be a challenge from a remote rural location. Where evidence of hybrid working was observed; this was generally in locations with reasonably priced flight connections to Glasgow and/or London, or quick ferry connections to the mainland. Where the place of employment is within reasonable travel distance, interventions could seek to facilitate hybrid working arrangements, addressing concerns over mental health impacts of remote working, reduced career progression, and employers' reluctance to engage with exclusively remote work arrangements, for example, through addressing connectivity or cost related barriers to hybrid working.

Mitigation requires further consideration, but could include providing support for local shared digital workspaces locally in a community hub or village hall. Such hubs may also facilitate innovative solutions for shared service provision, including shared transport and logistics.

Consideration for policy response:

- Consider mitigation for transport related barriers to hybrid working.
- Consider mitigation for individual barriers related to mental health and career progression.

4.3.2 Education

On remote learning, ONS evidence suggests person to person contact was considered partially substitutable at best, more substitutable in primary, than secondary, and less so for arts subjects than sciences. Evidence from the panel surveys reflected mixed perceptions, with only 46% of respondents feeling that digital substitution in education was acceptable. However, acceptance was higher (61%) for younger respondents, aged 18-34.

Experience from COVID-19 highlighted equality issues around the capacity of parents to provide support, and variations in the ability of school to cover the required material. There was anecdotal evidence that in some remote areas, digital delivery in secondary education has improved subject choice without pupils having to relocate.

The vulnerability of local primary schools to closure was reported as a barrier for families with young children looking to relocate to remote areas. Challenges around the sustainability of rural services also increase staff transport needs, with sharing of staff resources for example across several primary school locations requiring complex logistics.

Lack of access to higher education has long been a driver of rural outmigration, particularly for the young. Scottish Government (2010) provided evidence that poor transport accessibility to education opportunities acts as a push factor at least in some rural locations.

The adverse impacts on rural age structures were noted in Copus (2018), which projected an increase in dependency rations from 0.6 in 2011 to 0.74 in 2046.

Digital delivery by institutions such as the UHI could play a role in retaining some young adults in remote communities and research in the south-west and west of Scotland provided anecdotal evidence that some uptake of remote learning by young adults living in remote rural communities exist. While there was a consensus in the research regarding the value of the opportunities and experience gained by young leavers, and there is no suggestion that policy should intervene to stop young people leaving, remote learning may offer solutions for some wishing to stay in remote areas.

Consideration for policy response:

- Consider challenges around secure primary school provision.
- Remote delivery in higher education may increase options for young people looking to stay in rural areas. Further research is required to understand the scope.

4.3.3 Healthcare

Evidence from the literature review highlighted that digital substitution in services is a key growth area, with significant growth in applications in teleshopping, telemedicine and online banking.

Telemedicine is a key growth area. Considerations informing substitution include medical outcomes, cost, and practitioner efficiency. Evidence from COVID-19 highlighted that scope for digital substitution varies by activity. In medical applications, for example, routine and follow up consultations offer scope for substitution, while more complex diagnostic consultations produced better results when delivered in person.

This suggests that while substitution of medical appointments could play a role in providing day-to-day medical services in remote communities, both transport and digital connectivity continue to be required to enable access to healthcare.

Consultation with the academics further highlighted that a drive for centralisation in service delivery since the economic downturn of 2008/9 has required residents in the north of Scotland to make lengthy journeys to Inverness to attend in person hospital appointments, for example to access maternity services. This suggests the role of transport links in providing for more specialised and diagnostic communities' medical needs may have increased.

However, timetabled public transport services have not necessarily been increased. This was also reflected in the discussions during the focus groups. Participants generally rated the quality of local services as high but expressed concerns over their ability to access in person appointments. The focus groups stressed the role of contingency plans provided by the community in providing transport in medical emergencies. Community transport services may provide capacity for planned non-routine journeys.

Digital service delivery could also play a role in substituting physical access in such situations. In some remote communities in Ireland for example teleconferencing facilities in GP surgeries in have been introduced to reduce travel to the mainland for appointments in recent years.

However, drawing on evidence from the CDRC's Internet User Classification the academic expert interviews highlighted demographic differences and spatial variability in internet use. This showed that residents in rural areas with poor broadband connectivity used the internet for shopping or banking, but often found connectivity insufficient for teleconferencing. As a consequence, there is a risk that closure of local services could lead to an increasing disparity between accessible and remote areas, as internet speeds in some remote areas are insufficient to fully access services online. To avoid such inequalities, any introduction of digital service delivery needs to be preceded by testing the capacity of local connections to support the required applications. Experience from the Irish initiatives could inform mitigation for such adverse impacts in the design of similar interventions in the future.

The study therefore highlights that challenges around rural service delivery are unlikely to have a single solution. In order to address the logistical and personal transport challenges around changes in the spatial pattern of service distribution, there is a need for a cross-sectoral response which should include participation from those responsible for planning transport and digital services.

The panel surveys also highlighted attitudinal barriers. Less than half of respondents felt that digital substitution of medical appointments is acceptable, with limited variation across age groups.

Consideration for policy response:

- Consider how local provision, physical travel to services and digital connectivity can best combine to provide for the healthcare needs of rural residents.
- Adopt a cross-sectoral approach to service planning including both representatives from departments responsible for planning service provision (e.g. health and education) and transport provision as routine.
- When pursuing digital service planning this needs to be preceded by testing the capacity of local connections to support the required applications.

4.3.4 E-commerce and banking

Evidence on e-commerce showed high acceptance of levels of digital shopping. However, there was limited evidence that this reduced in-person shopping trips. The panel surveys suggested this holds true for rural populations in Scotland, despite the substantial distances involved.

Academics noted research to develop a Priority Places Index which highlights distance to food retail locations as a challenge to the sustainability of remote communities. Concerns around transport costs extended to deliveries, with remote

communities refused or facing substantial surcharges, representing a barrier to the use of digital substitution in this area.

Evidence from the Scottish Parliamentary Information Centre quoted in Press and Journal (2022) notes delivery surcharges worth £45 million were incurred by residents in areas commonly impacted by parcel delivery surcharges. While the impacts and regulation requirements around such proposals requires Government legislation, the article reports commercial proposals to reduce such costs by using drones.

The importance of local shops in supplying local populations with a range of essential services, including postal services, bill payments, cash machines, grocery deliveries, and food bank usage was emphasised by the Association of Convenience Stores (2023). Their role was also noted by participants in the focus groups who expressed concern over long travel distances to supermarkets. There is evidence that some are affected by closures and the literature review and market research raised the need to consider equality impacts around digital substitution for these services, particularly for the elderly or less digitally able.

Digital technologies can enable local responses to increase rural resilience, for example through coordinating community transport schemes which enable access where local services have been closed and time-tabled public transport services do not exist.

In some smart villages, communities also use digital technology to help match demand and coordinate the use of pool cars to provide personal transport. Social enterprises such as La Exclusiva eliminate home delivery fees through coordinating orders which can play a role in addressing the cost of delivering goods to remote locations.

Consideration for policy response:

- Consider barriers to delivery of online services around high delivery costs in remote rural areas. Technical solutions could include use of drones.
- Consider facilitating digitally enabled community led solutions and social enterprises, such as community transport, pool cars and pooled deliveries.

4.4 To what extent do the above variables impact on depopulation occurring within communities?

Scotland's rural population increased in 2021. Even in remote areas, digitally enabled remote working during COVID-19 has led to small population increases in at least some locations that previously experienced population decline. This is evidenced by NRS mid-year population estimates which show that population in these areas increased by 1.6% between 2020 and 2021, driven by a marked increase in net-migration. However, there is an evidence gap in how this increase is composed, to what extent it may address problems around population aging, and how it may affect the long-term sustainability of remote communities.

Natural population aging and the outflow of young people have unbalanced the age structure in many remote areas, making population levels unsustainable. This has created challenges around the viability of rural economies and the security of rural service provision.

4.4.1 Vibrancy of the rural economy

The relevance of rural businesses to individual location decisions is two-fold. Vibrant rural economies could address concerns over access to employment opportunities which have been noted as contributing to rural depopulation. The role of SMEs in the rural economy was also noted, and for owners of such businesses, business and residential location choice often represent a single decision.

Academic experts noted that connectivity improvements, both physical and more recently digital, have increased location flexibility for many industries. However, this flexibility is subject to limitations. Services such as hospitality require transport links to enable access from staff and customers, and industries such as farming, fishing and forestry are tied to the location of key natural resources. Businesses in key rural sectors of the economy therefore require a combination physical mobility and digital connectivity to thrive.

Digital connectivity plays an increasing role in supporting viability of businesses in key rural sectors including the creative sector, farming, and tourism, through enabling access to customers and information, assisting with business administration requirements, and enabling innovative production methods. However, many sources in the literature noted that the quality of digital connections often prevents digital technologies from optimally supporting these businesses.

4.5 Can potential future access interventions consider the above variables in the context of proactively supporting attraction and retention within locations of Scotland which have experienced, or are experiencing, population decline?

The literature review identified key intervention success factors for repopulation initiatives in remote areas. These include:

- Availability of financial resources.
- A holistic consideration of the full range of drivers and constraints when developing repopulation initiatives rather than focusing on a single issue such as connectivity.
- A bottom-up approach, rooting such initiatives in the communities.
- Targeting integration as well as attraction of new arrivals.
- Enabling economic diversity.

A number of additional factors that apply where such initiatives focus on connectivity improvements have been identified in the course of this study, and are described below:

- Need to consider un-intended consequences, for example those associated with pump-effects and local trade-offs.
- Need to consider where to target connectivity improvements, i.e. strategic versus local investment.
- Need to consider the need of groups that are key to community sustainability when planning connectivity improvements.
- The need to account for barriers around the digital divide and the cost of connectivity.

4.5.1 Holistic consideration of the full range of drivers and constraints

Low transport densities are widely recognised in the literature, as a constraint on rural opportunities including access to education, job opportunities, and services. In terms of location choice good transport and digital connectivity have emerged as pre-requisite but not sufficient to attracting and retaining population and ensuring the viability of local businesses in remote areas. Evidence from a range of sources stressed the complexity of the drivers of depopulation in remote areas.

Some factors such as fertility rates and shortages in housing availability cannot be addressed by connectivity improvements. Transport or digital connectivity are relevant to facilitating access to opportunities in relation to others such as employment and services. However, discussions with academic experts noted that the spatial planning approaches for employment and services and for the transport networks and services required to access them have not always been joined up sufficiently. One example was the increased centralisation of medical services. Closures of local healthcare facilities together with a deterioration in public transport connectivity and reduced funding for community transport were noted to have left some residents reliant on emergency transport services to access hospital services in some instances. Integrated solutions are required to address such challenges.

Consideration for policy response:

- An integrated policy response, considering housing, employment, service provision as well as transport and digital connectivity services is required.
- Engagement with transport/digital network planners should be routine for any changes in service distributions or initiatives to move services online.

4.5.2 Consider unintended consequences

There is evidence that transport improvements such as the construction of the Kessock, Cromarty Firth, and Dornoch Firth Bridges have contributed to the revival of rural economies and communities. On the converse, poor transport connectivity was noted by the literature review and fieldwork as push factors in the context of individual relocation decisions.

While there was a gap in explicit research into the role played by digital connectivity in individual re-location decisions, evidence from house price statistics suggested that good digital connectivity does play a role in residential location decisions. There was also evidence that high quality digital network connections can increase the economic viability of rural areas evidenced by indicators such as the number of businesses, reduce unemployment, and increase pay.

This suggests that improvements in transport and digital connectivity can attract development and population, however, there is a need to anticipate and consider trade-offs that can see communities outside the immediate reach of such improvements decline.

Investments in strategic connectivity are often associated with pump effects, whereby improvements disproportionately benefit locations which were well connected to begin with. Such effects can put local businesses and services at risk. Pump effects have been highlighted in connection with both transport and digital connectivity interventions.

Existing populations in many remote areas are sparse and the number of newcomers required to invert population decline in many rural locations is small. There is therefore an implicit risk of unsustainable growth in some locations while other areas are neglected. A level of ‘over-heating’ in terms of population growth was noted in connection with some accessible rural areas, and in some remote locations the impact of incomers on local housing affordability was noted.

Consideration for policy response:

- Consider trade-offs including pump-effects and local differences in the distribution of benefits, and plan for mitigation.

4.5.3 Transport versus digital connectivity

Changes in expectations, approaches to service delivery, and communication in general mean that good digital connectivity has become a prerequisite. During the panel surveys younger age groups emphasised considerations of broadband speeds in relocation decisions with 31% of 18 to 34 year olds rating this as one of their top location choice criteria, compared with 3% of those aged 55+. Good digital connectivity could also enhance rural quality of life and economic viability, so long as digital exclusion effects are overcome.

However, good digital connectivity has in many ways emerged as complementary to physical presence, be it through vicinity to opportunities, services, and amenities, or through making them more accessible through providing good transport connectivity. Evidence has pointed towards its scope in supplementing physical connectivity to services, reducing the need to travel in areas where physical access is poor. Digital tools could also improve the efficiency of rural transport provision through improving passenger information and aligning available resources to demand. Intervention to

address rural sustainability through connectivity improvements therefore needs to consider both.

Consideration for policy response:

- Take an integrated view of rural connectivity improvements, providing both transport and digital connections to facilitate the connectivity needs of rural areas.
- Explore scope for digital tools to improve the efficiency of rural transport by improving passenger information and aligning available resources to demand.

4.5.4 Strategic versus local investment

Transport connectivity investments to address depopulation need to consider whether to focus investment on strategic or local connections in order to best support the viability of remote places. There is some rationale for both.

Academic experts highlighted the relevance of the local network of feeder roads and local bus services to enabling access to essential services. However, the role of strategic connections to the viability of key local economic sectors such as tourism was similarly noted.

Connectivity also plays a role in defining the search area for residential locations. In the context of remote working for example the time taken to meet requirements for occasional visits to the office may limit residential choice. Both strategic and local connections are likely to impact.

In the case of some remote routes the functions of strategic and local were noted to overlap. One example is the A835 which provides trunk road connections to the north-west of Scotland but also enables access to hospital services for local communities in the north-west.

Consideration for policy response:

- A spatial strategy / planning approach should seek to limit adverse impacts including local trade-offs, pump effects and over-heating in some areas and neglect of others. It could also help weigh off the pros and cons of strategic versus local investment.

4.5.5 Consider the Needs of Groups that are Key in Building Sustainable Communities

Population projections discussed in Section 2.1 highlighted that pre-COVID 19 population trends were affected by two challenges in remote rural areas: negative population growth and an unsustainable age structure caused by natural population aging and the exodus of young people.

There is some indication that remote working during COVID-19 has to some extent addressed the first with some remote areas experiencing growth recently. However, the evidence reviewed suggested that a relatively high proportion of this may have

been made up by ‘empty nesters’ or older working age adults whose children have left home, and as such may have exacerbated problems related to the unbalanced age structure of rural communities. Copus (2018) and other sources suggest that attracting young people and young working age adults should be a key target group when considering initiatives to respond to rural depopulation, and ensuring their needs are identified and considered is key to their success.

However, academic experts noted that young and young working age people are often a hard to reach group and there is a risk therefore that their needs are at times underrepresented. Public transport provision was cited as an example where network and service provision does not always account for the needs of the economically active.

Consistent research may be needed to understand the barriers for this group and ensure that their needs are represented in network planning and other interventions targeted.

Consideration for policy response:

- Consider the needs of young and younger working age people in connectivity intervention design including network planning.

The research also identified a gap in understanding of the holistic picture which integrates the potential function of the different groups that make up migration, including those that wish to stay, returners, digitally enabled remote workers, digital nomads, and EU migrants. Existing research tends to focus on a single group.

Joined up research required to consider the potential role of each of these group in the context of community sustainability and understand how they can be supported.

Consideration for policy response:

- Develop joined up picture of the potential contribution of different migration groups to sustainable communities in remote rural areas and consider targeted interventions.

4.5.6 The cost of connectivity

Transport affordability was flagged as a challenge in many sources, including Highlands and Islands Enterprise (2022). The Scottish Government currently provides public transport subsidies for people aged 16-22 and 60. Young working age adults are excluded from free bus travel but they are key in creating sustainable communities. Academics highlighted that rural wage structure often increases the vulnerability of this group to increases in cost.

A Scottish Government review of Poverty in rural Scotland: evidence review in A Minimum Income Standard for Remote Rural Scotland: A Policy Update noted that rural communities in Scotland are subject to a substantial cost of living uplift. The contribution of transport costs to the uplift was substantial. In 2021 a working age single person living in remote rural areas in the Highlands incurred weekly travel costs 73% higher than those living in urban UK. In Island communities the uplift was 40%. While digital interventions could offer mitigation by eliminating the need for some journeys, discussions above noted that the scope for substitution in many applications is affected by inequalities arising from differences in network connectivity and capacity of the population to engage with digital solutions.

Higher transport costs have also been noted in connection with the delivery of goods, with additional delivery charges for Island communities and some areas of the Highlands.

Evidence from the literature suggest that the cost of living has recently played a more prominent role in decisions to relocate. Anecdotal evidence also highlighted that returners often depend on family support due to the cost of living and this may prevent or impact on the long-term viability of decisions to return.

Policy initiatives to address population challenges through connectivity improvements therefore need to consider barriers presented by cost inequalities around connectivity, including transport costs and the cost of digital connectivity.

Consideration for policy response:

- Consider mitigation for the impacts of transport costs, including public transport fares, fuel costs and delivery costs on rural costs of living for all groups including working age people.

4.5.7 The digital divide

The ‘digital divide’ presents a key barrier to policies seeking to enhance rural vibrancy through the opportunities afforded by improved digital connectivity. The term encompasses a range of factors that cause inequalities in communities’ ability to take advantage of digital solutions, including issues around poor connectivity, high cost due to limited competition, and differences in the level of digital adoption across communities. These factors may reinforce existing exclusion patterns, and equality impacts need consideration.

In line with the Scottish Government’s target to connect 100% of premises to superfast premises by 2021, much of the UK mainland is now connected to fibre optic broadband. However, evidence collected by the study suggested that a number of super-fast ‘not-spots’ do exist in remote, sparsely populated areas. The development of high-speed digital infrastructure was noted to show a similar pattern and be constrained by similar factors as physical connectivity, including cost, legal, and logistical constraints.

Newcomers and returners during and after the COVID-19 lockdowns highlighted that connectivity was not always able to support several concurrent demands. Literature documenting academic research with the owners of businesses in the creative sector highlighted that some found connectivity insufficient to support the competitiveness and viability of their business after moving to remote rural areas.

During the focus groups, participants who had recently moved to rural areas unanimously noted challenges with standard internet and mobile phone connectivity. This impacted on the cost of their connection as well as their ability to work effectively. Challenges accessing digital services were also said to increase the risk of loneliness in particular for old people.

In some areas affected by poor connectivity, alternatives have been provided by community broadband initiatives or satellite connections. However, opportunities to set-up the former are dependent of local community capital while the latter tend to come at a relatively high cost. Some investment in support would therefore be required to enable such initiatives to address barriers presented by the digital divide.

Consideration for policy response:

- Meaningfully map and better understand barriers around the digital divide. Consider and mitigate their impacts on connectivity led interventions to address population challenges.

4.5.8 Root interventions in local communities

Due to their geographic spread, rural communities in Scotland are diverse in terms their composition, employment structures, connectivity challenges, and the capacity of the communities to drive solutions. This presents a challenge with respect to developing a one size fits all policy response to local population challenges. The literature review and consultation highlighted the importance of considering this diversity and involving local communities in shaping policy response to population challenges.

Evidence from the focus groups highlighted the role of perceptions around the strength of rural communities in attracting newcomers to rural areas. Consultation with academic experts also raised anecdotal evidence that a higher proportion of those who leave for education return, that they may be returning earlier, and that this may be related to a revived interest in local ways of living and culture may have encouraged this recently, including in the Gaelic language.

The role of local communities in driving local response to the challenges posed by remoteness was also highlighted. This can include informal solutions or community led interventions, such as community broadband provision, local remote working hubs, and community transport services. Examples were quoted where local communities drove the regeneration of places with notable success.

However, initiatives to support community led approaches need to consider how to support those in less able communities to partake. Unsupported, over-reliance on

communities to drive interventions could create inequalities due to differences in their capacity.

Consideration for policy response:

- Policy response need to consider the diversity of remote localities. Engagement with and rooting initiatives in local communities were considered key success factors.
- Strategies to support communities in driving interventions need to account for differences in capacity and consider support in mitigation.

4.6 Limitations and Further Research Requirements

The above report discussed the complex factors contributing to household location decisions in the context of policy to address rural de-population in Scotland. The report considered the potential role played by connectivity improvements in enabling such a policy response, their importance largely emerged as pre-requisite but insufficient on its own.

It also examined the interactions between digital and transport links, and the scope for digital substitution of physical connectivity. Accelerated by COVID-19, partial digital substitution has become reality in many workplaces and in the delivery of many private and commercial services. However, complete substitution is rare. More often digital and transport connectivity were highlighted as complementary.

Looking at rural depopulation, the report found that digitally enabled remote working has inverted population decline in some locations, without formal policy intervention. However, a coherent picture of the distribution of these effects was not available at the time of writing. Neither was consistent quantitative data on the demographic composition of these population movements.

Digital and transport connectivity were shown to be essential to the development of sustainable communities but were also often found to be wanting. In order to develop connectivity interventions that can best support local community sustainability, further research is required to better articulate where improvements are needed, by whom and to what purpose.

This may include:

- Developing understanding of what a sustainable community is in the remote rural context and how considerations related to digital substitutability of transport change this. This will require close work with communities to account for the local diversity of the challenges. It will also require cross-sectoral work to articulate local connectivity requirements and understand the potential role played by transport and digital connectivity.
- Comprehensive data analysis to understand the spatial distribution and demographic composition of recent rural in-migration across remote rural areas in Scotland and understanding of the role remote working has played in this to-date,

to inform the design of evidence based and spatially targeted interventions. One available, census data will provide a starting point.

- Research to form a holistic picture of the impact different groups such as empty nesters, people leaving urban areas in search of a better life, and digital nomads can have on the short-term vibrancy and longer-term sustainability of rural communities, or otherwise, and to consider their respective contributions to sustainable communities together, the identification of barriers and concerns for each group and the development of targeted interventions for each.
- Understanding of the impact of digitally enabled newcomers on existing populations and hence rural out-migration.
- Primary research on pull factors and barriers for key groups such as young adults, families and returners, and how they can be supported and incentivised.
- Better understanding of barriers around the capacity of digital network speeds and the ability of local networks to cope under concurrent demands how this relates to local requirements to develop a “hierarchy of need” to inform the development of connectivity.
- Better understanding of the transport requirements of key groups when planning transport improvements and research into how best to meet transport affordability challenges, including with respect to public transport affordability, fuel costs and inequalities around the cost of and access to deliveries

The report has also highlighted the need to consider potential unintended consequences, including exacerbation of population aging, further restricting access to affordable housing and adverse impacts on rural foundation industries and essential services and digital inequalities.

Appendix A Profile of respondents to online survey

This appendix shows the council each resident lives compared to Census data.

Council	Census data	Survey data
Aberdeen City	4.2%	5.5%
Aberdeenshire	4.7%	6.4%
Angus	2.1%	0.4%
Argyll and Bute	1.6%	3.2%
City of Edinburgh	9.9%	6.4%
Clackmannanshire	0.9%	1.7%
Dumfries and Galloway	2.8%	4.7%
Dundee City	2.7%	0.5%
East Ayrshire	2.2%	3.1%
East Dunbartonshire	2.0%	0.8%
East Lothian	2.0%	3.1%
East Renfrewshire	1.7%	0.8%
Falkirk	2.9%	2.0%
Fife	6.8%	5.6%
Glasgow City	11.8%	10.6%
Highland	4.4%	4.8%
Inverclyde	1.4%	0.5%
Midlothian	1.7%	2.0%
Moray	1.8%	2.3%
Na h-Eileanan Siar	0.5%	0.3%
North Ayrshire	2.5%	3.1%
North Lanarkshire	6.1%	4.0%
Orkney Islands	0.4%	0.8%
Perth and Kinross	2.8%	4.1%

Renfrewshire	3.3%	3.7%
Scottish Borders	2.1%	4.7%
Shetland Islands	0.4%	1.2%
South Ayrshire	2.1%	2.1%
South Lanarkshire	5.8%	4.9%
Stirling	1.7%	2.1%
West Dunbartonshire	1.6%	0.8%
West Lothian	3.3%	4.0%
Base (age 18+)	**4,454,919**	**752**

Source: National Records of Scotland: Mid-2021 Population Estimates

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