

Intervention 9a – Development of Glasgow Metro strategies

1 Description of Package

Glasgow Metro is an umbrella term or brand to describe a new level of public transport provision to serve and improve connectivity within the Glasgow conurbation. This would be focussed on Glasgow and the immediate surrounding areas in East Dunbartonshire, East Renfrewshire, North Lanarkshire, Renfrewshire, South Lanarkshire and West Dunbartonshire. The operating range will be determined by the characteristics of individual lines; informed by ranges established in a benchmarking exercise. In terms of specific modes this may include one or more of bus rapid transit, tram, light rail and/or metro rail, with the network complementing and being integrated with the bus and heavy rail networks. It may include completely new alignments, reuse of disused former railway alignments and/or the conversion of existing rail alignments to a new mode. It will be targeted at improving connectivity within and across the conurbation; the city and immediate surrounding urban areas, and will augment and be integrated with the bus and rail network.

While corridors are not yet defined, it is envisaged that these will focus on:

- Unserved and underserved areas with relatively poor connectivity;
- Improving access to key hubs such as the city centre, hospitals, major education facilities, key employment centres, retail hubs, and major leisure/sports facilities;
- Integrating with major transport hubs such as Central and Queen Street railway stations, Glasgow Airport and suburban interchanges.

This project will be further developed and appraised in the remainder of STPR2, however in Phase 1 the focus is on why Glasgow and the wider city region would benefit from Glasgow Metro.



2 What we have heard?

Responses to the STPR2 Public Online Survey from the Glasgow City Region included the following key problem and opportunity themes:

- Problems around a disconnected rail and subway service with a lack of cross region connectivity including a lack of reliable public transport connections from Glasgow City Centre to Glasgow Airport with frequent specific mention of the lack of direct rail link to Glasgow Airport;
- A desire to improve bus priority, journey times and reliability with bus being viewed as a mode that often gets hampered by congestion making it less attractive; and
- Opportunities including more local bus and public transport services for the south side of Glasgow, the creation of a Glasgow Crossrail and the creation of light rail / metro system from Glasgow Airport to Glasgow Central Station.

In the STPR2 National Rail workshop, stakeholders identified a need for:

- The adoption of light rail (“metro”) services on Glasgow South rail routes to release capacity at Glasgow Central for longer trains and longer-distance services;
- Longer trains and increased service frequency at stations such as Glasgow Central to enable Network Rail, NTS2 aspirations and proposals; and
- Metro trains for local, commuting routes (e.g. Glasgow South services, such as Cathcart Circle etc.).

The Transport Scotland bus operator ‘call for information’ undertaken in 2017, concluded that there are a number of areas across Scotland where buses experience significant congestion; most noticeably within and on approach to Glasgow City and surrounding areas.

The concept of a Glasgow Metro was also recommended by the Glasgow Connectivity Commission in their second report in April 2019¹. They propose that a ‘first priority of such a wider strategy to transform the fixed public network should be the creation of comprehensive Glasgow Metro for the city. The Glasgow Metro would be a network of high capacity rapid transit lines serving as much of the city as possible so that the fixed transport system plays the fullest possible role in ensuring inclusive growth across the city’s communities, sustaining the international competitiveness of the key employment concentrations in and around the city centre.’

¹ Connecting Glasgow, Creating an Inclusive, Thriving, Liveable City, Glasgow’s Connectivity Commission, April 2019, <https://www.glasgow.gov.uk/CHttpHandler.ashx?id=45064&p=0>

3 The evidence base to support a case for change

Connectivity and Accessibility

The Glasgow City Region contributed nearly a third or £42.9 billion of the Scottish Gross Value Added (GVA), £20.4 billion of which is solely from Glasgow City². This is the third highest regional contribution per head in Scotland. Despite this, Glasgow City economic activity levels are lower at 70.7% compared to a Scottish Cities benchmark of 75.6%. Over the last decade, Glasgow has recorded the second-highest increase in productivity of any of the UK Core Cities, but GVA per hour is 86.4% of the UK average whereas both Aberdeen and Edinburgh are well above the UK average. Productivity in areas such as North Lanarkshire, South Lanarkshire, and East Ayrshire and North Ayrshire is lower still.³

The Glasgow City Region has a slightly higher rate of unemployment⁴ at 4.0% compared to the national figure of 3.5% with a mean unemployment in Glasgow City sitting at 4.7%, which is 0.6 percentage points higher than the Scottish Cities benchmark. Between 2014 and 2019, unemployment in the region decreased by 3.6 percentage points, compared to a 2.8 percentage point decrease nationally, while Glasgow City unemployment decreased by 5.1 percentage points, compared to a 3.0 percentage point decrease for the Scottish Cities benchmark.

According to the independent Joseph Rowntree Foundation (JRF)⁵, unaffordable and unreliable local public transport is limiting access to job opportunities for residents of low-income neighbourhoods in the Glasgow City Region. In their report considering tackling transport-related barriers to employment in low-income neighbourhoods, the JRF note that ‘transport is a key barrier to employment for many residents living in low-income neighbourhoods. All too often, public transport is seen as something that constrains rather than enables a return to work.’, with greater coordination and collaboration between the different authorities and transport bodies being required to ensure transport and employment policy are better integrated.

Figure 1 illustrates the accessibility in the region to key employment centres by public transport on a typical weekday morning. Key employment locations⁶ are mostly located in Glasgow City followed by North and South Lanarkshire. Access by public transport in

² ONS, Regional gross value added (balanced) by industry: local authorities by NUTS1 region: UKM Scotland chained volume measures in 2016 money value, 2018, <https://www.ons.gov.uk/>

³ Connecting Glasgow, Creating an Inclusive, Thriving, Liveable City, Glasgow’s Connectivity Commission, April 2019, <https://www.glasgow.gov.uk/CHttpHandler.ashx?id=45064&p=0>

⁴ ONS, Official Labour Market Statistics (Nomis), 2019, <https://www.nomisweb.co.uk/>

⁵ Joseph Rowntree Foundation. Press release: Families in the Glasgow locked out of jobs market by ‘unaffordable and unreliable’ local transport, 2018, <https://www.jrf.org.uk/press/families-glasgow-locked-out-jobs-market>

⁶ ONS, Identification of top 10 employment locations across the region by number of employees was based on employment data

the Glasgow City area is generally 30-40 minutes or less by public transport. A large proportion of the built-up areas in the region can be accessed by public transport within 50-60 minutes, although travel times toward the outer boundaries of the region can reach up to 90 minutes or longer.

from the Business Register and Employment Survey (BRES).

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/businessregisterandemploymentsurveybresprovisionalresults/previousReleases>

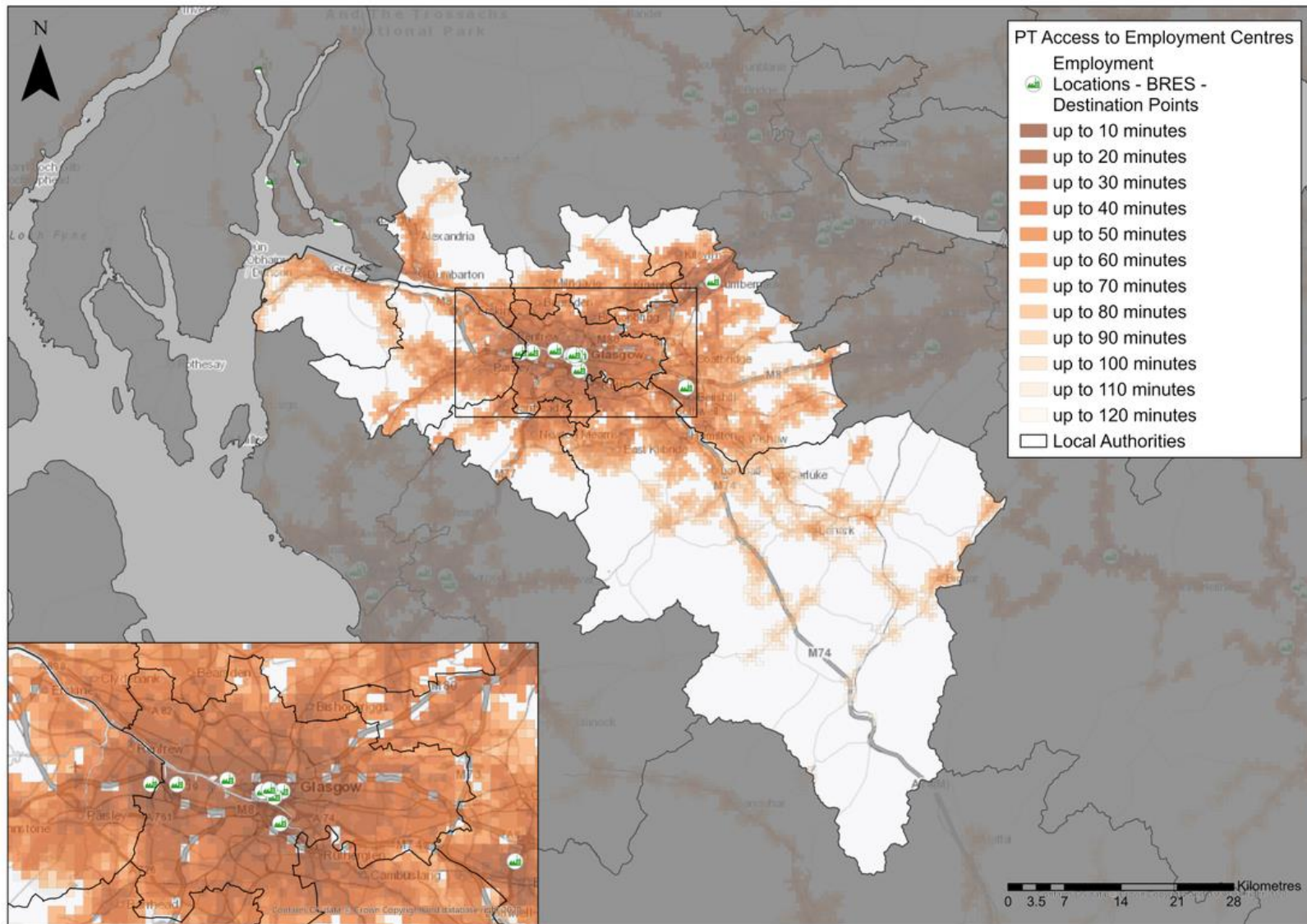


Figure 1: Public Transport to Employment Centres in the Glasgow City Region, (on a typical Tue 06:00-10:00hrs), TRACC

Public Transport journey times should also be considered against the background of public transport frequency with some areas having quite different levels of frequency. Figure 2 shows rail and bus frequency within Glasgow City for a typical weekday morning. What this shows is that whilst there is a relatively uniform pattern in the City for journey time to key employment areas by public transport, there can be quite different levels of service. This can make regular commuting more problematic due to reduced number of options and limited flexibility.

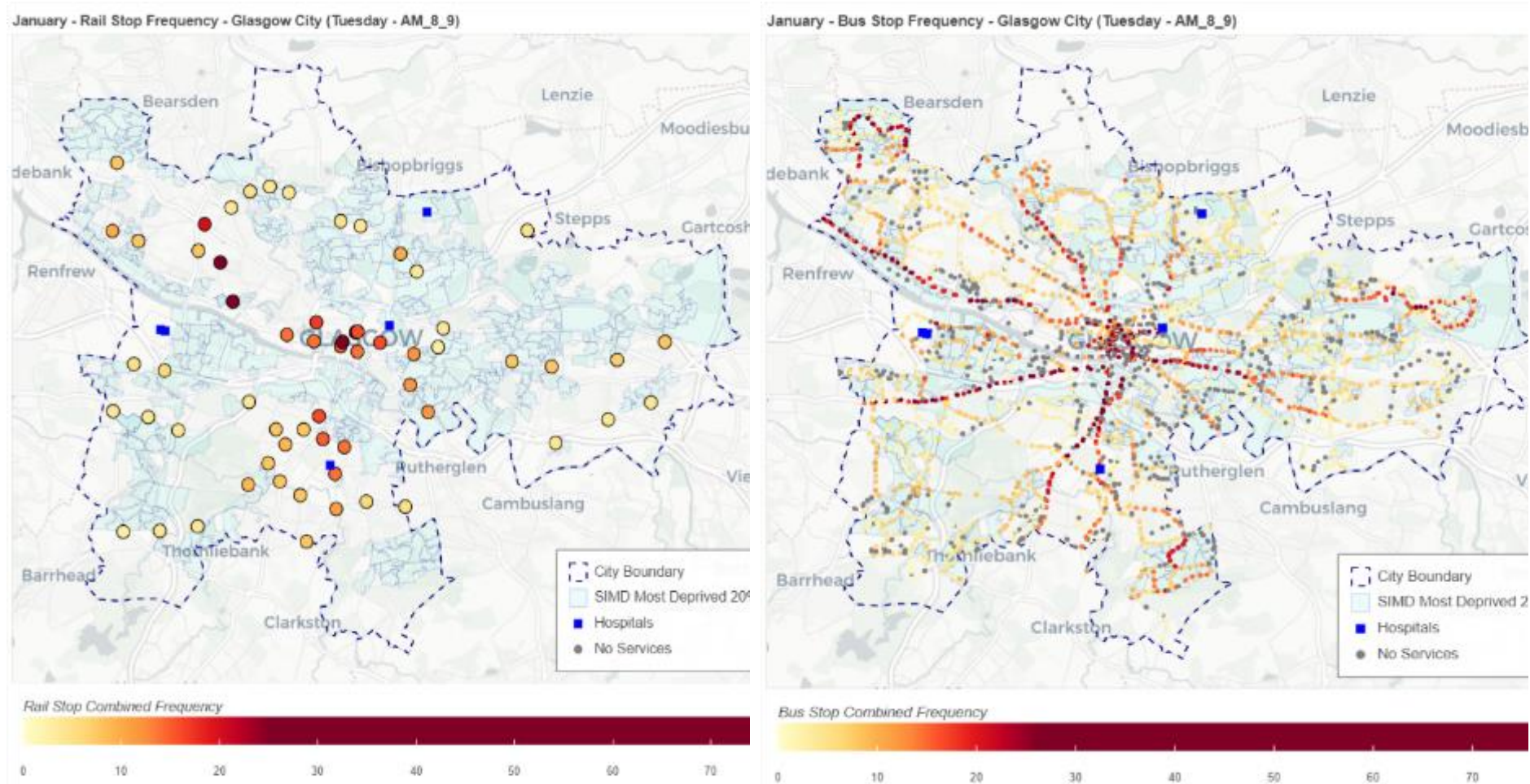


Figure 2: Rail and Bus service frequency in Glasgow City (on a typical Tue 08:00-09:00hrs)

Figure 3 illustrates journey times to higher and further education centres by public transport. Public transport access to and from universities and colleges is broadly similar to the patterns for access to employment. Higher and further education institutions are mostly concentrated in or near Glasgow City, though there are some significant further education campus locations in more suburban locations, such as Glasgow Clyde College locations in Anniesland, Cardonald and Langside.

Access to education is of particular importance in the region with relatively poor levels of educational attainment compared with other Scottish regions. Within the Glasgow City Region 13.2% of people had no qualifications; which was 3.3 percentage points higher than the national benchmark. Between 2014 and 2019 there was an increase of 0.5 percentage points in the proportion of people with no qualifications in the region. The highest level of people with no qualifications was in Glasgow City with 16.4% followed by North Lanarkshire at 15.0% and West Dunbartonshire at 14.2%.

A report considering the impacts of inequalities in mobility and access⁷ prepared for the DfT notes that lack of transport options can reduce children's access to out of school activities including academic activities and that poor transport choices were linked with low participation by children / adults over 16 in education and increased levels of further/higher education dropouts. The report also explores the relationship between poor transport options leading to a lack of access to opportunities and subsequent social exclusion.

⁷ Institute for Transport Studies, University of Leeds on behalf of DfT, Inequalities in Mobility and Access in the UK Transport System, March 2019

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/784685/future_of_mobility_access.pdf

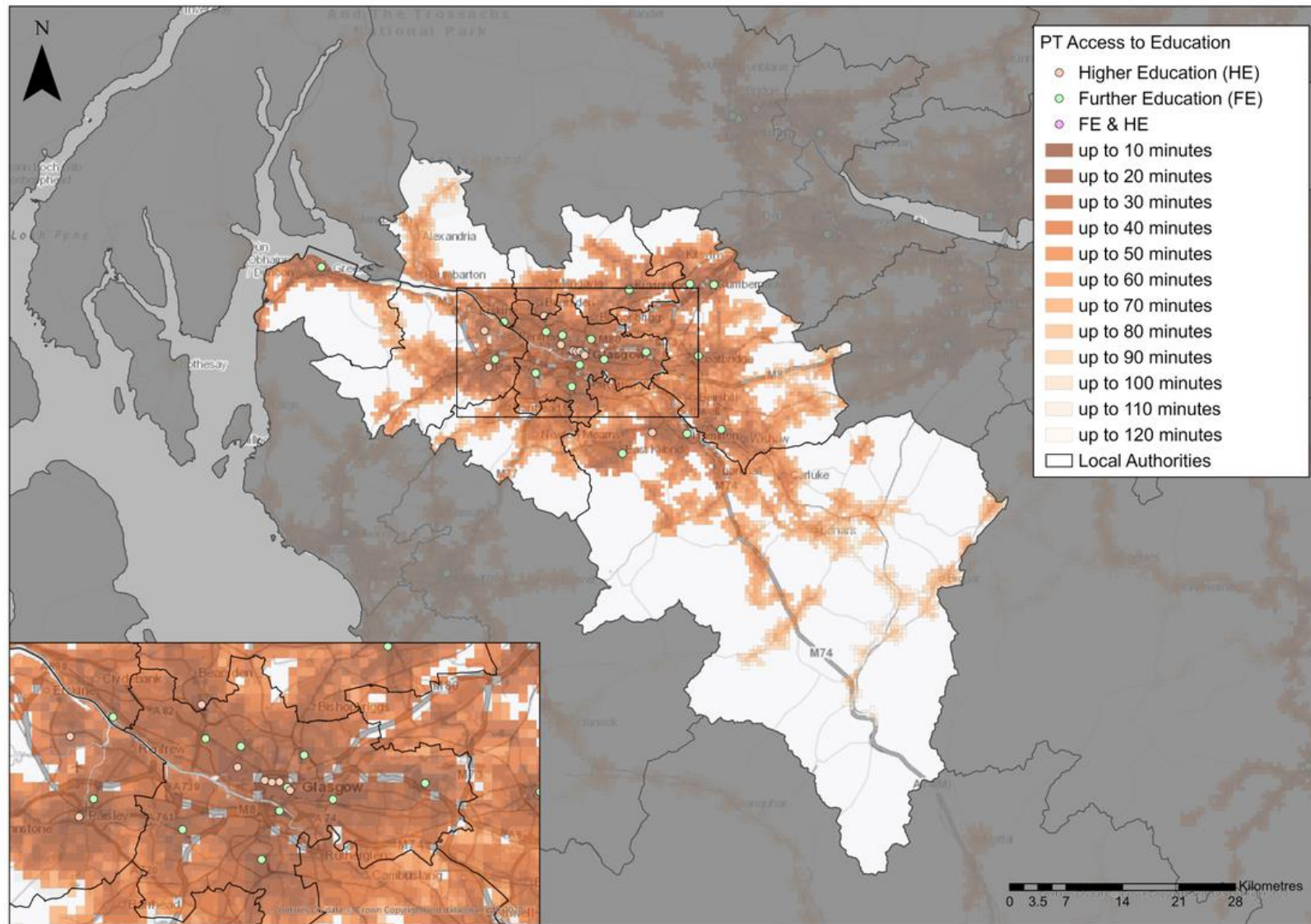


Figure 3: Public Transport to Higher & Further Education in the Glasgow City Region (on a typical Tue 06:00-10:00hrs)

Health and Deprivation

The Scottish Index of Multiple Deprivation⁸ (SIMD 2020) demonstrates the socio-economic issues experienced in the Glasgow City Region. Glasgow City has the highest percentage of data zones that are most deprived, with 45% of its data zones in the 20% most deprived nationally; these are shown by the red colours in Figure 4.

SIMD Health rankings, as shown in Figure 5 indicate that health quality throughout the Glasgow City Region is varied. In Glasgow City, 48% of data zones are ranked within the lowest quintile (20% most deprived) for health in Scotland, while in contrast East Renfrewshire and East Dunbartonshire respectively have 7% and 8% of data zones within the lowest quintile. Between 32% and 36% of data zones within East Renfrewshire and East Dunbartonshire fall within the top quintile in Scotland, while Glasgow City, North Lanarkshire and West Dunbartonshire only have 10%, 4% and 5% respectively.

Figure 6 illustrates journey times to key hospitals within the region by public transport. Accessibility analysis shows that the majority of Glasgow City Region residents can access healthcare within 60 minutes by public transport, but there are areas, particularly on the further out areas of South Lanarkshire, Renfrewshire and East Dunbartonshire that are unable to access key hospitals within 60 minutes.

⁸ *The Scottish Index of Multiple Deprivation (SIMD) identifies small area concentrations of multiple deprivation across all of Scotland in a consistent way. It allows effective targeting of policies and funding where the aim is to wholly or partly tackle or take account of area concentrations of multiple deprivation. SIMD ranks small areas (called data zones) from most deprived (ranked 1) to least deprived (ranked 6,976). People using SIMD will often focus on the data zones below a certain rank, for example, the 5%, 10%, 15% or 20% most deprived data zones in Scotland. Available at: <https://www2.gov.scot/Topics/Statistics/SIMD>*

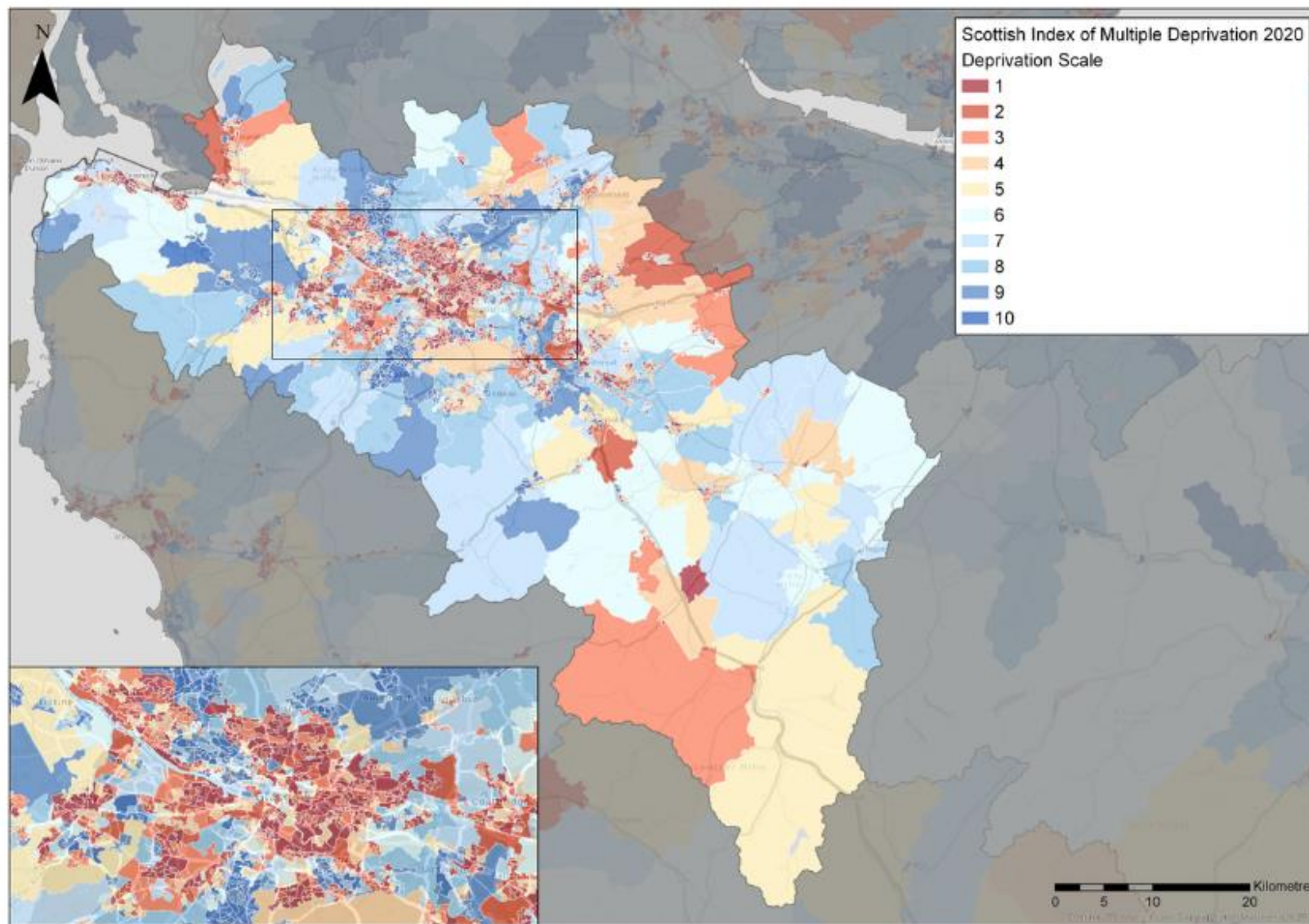


Figure 4: Glasgow City Regions Scottish Index of Multiple Deprivation (SIMD) overall SIMD Rank

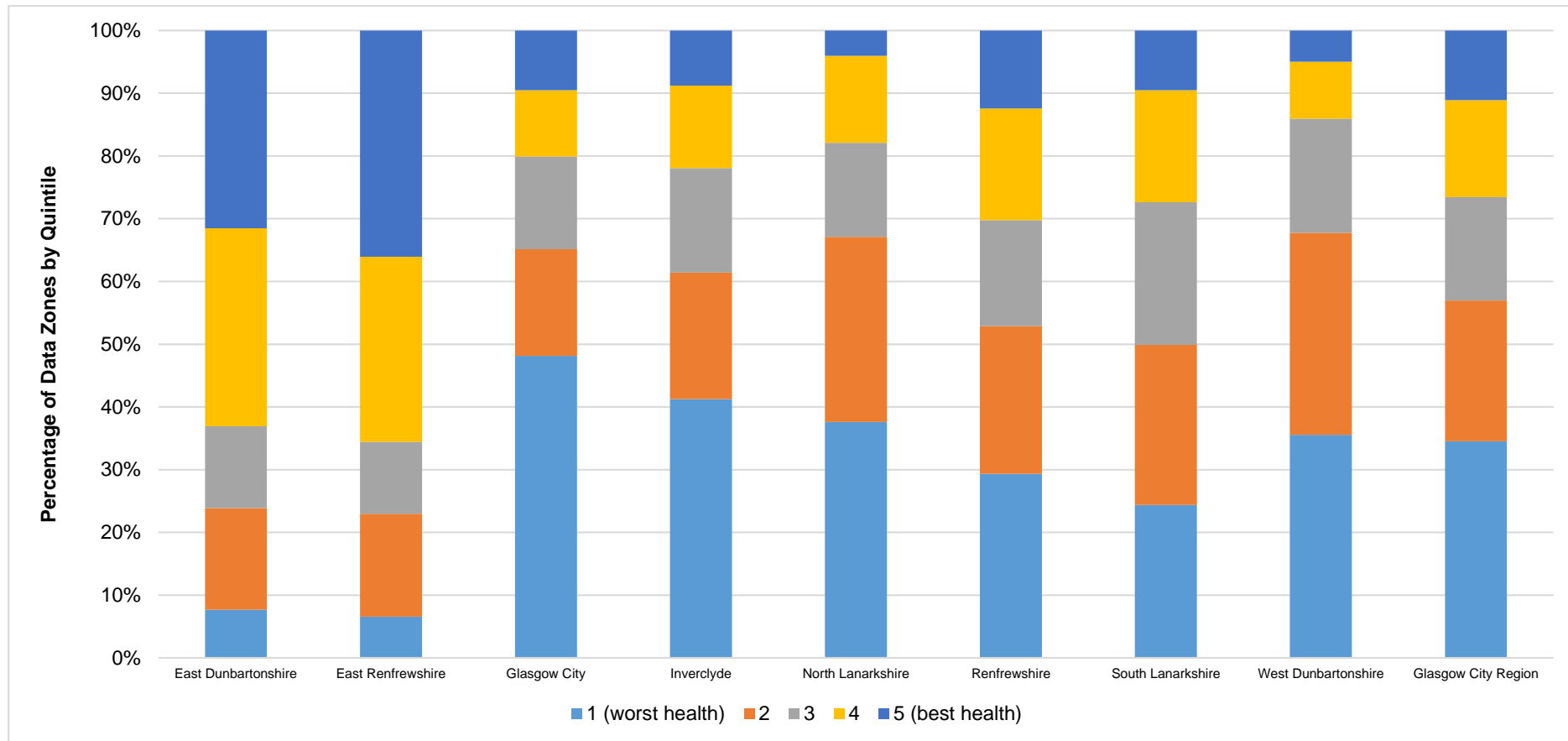


Figure 5: SIMD (2020) Health Indicator Distribution by Local Authority

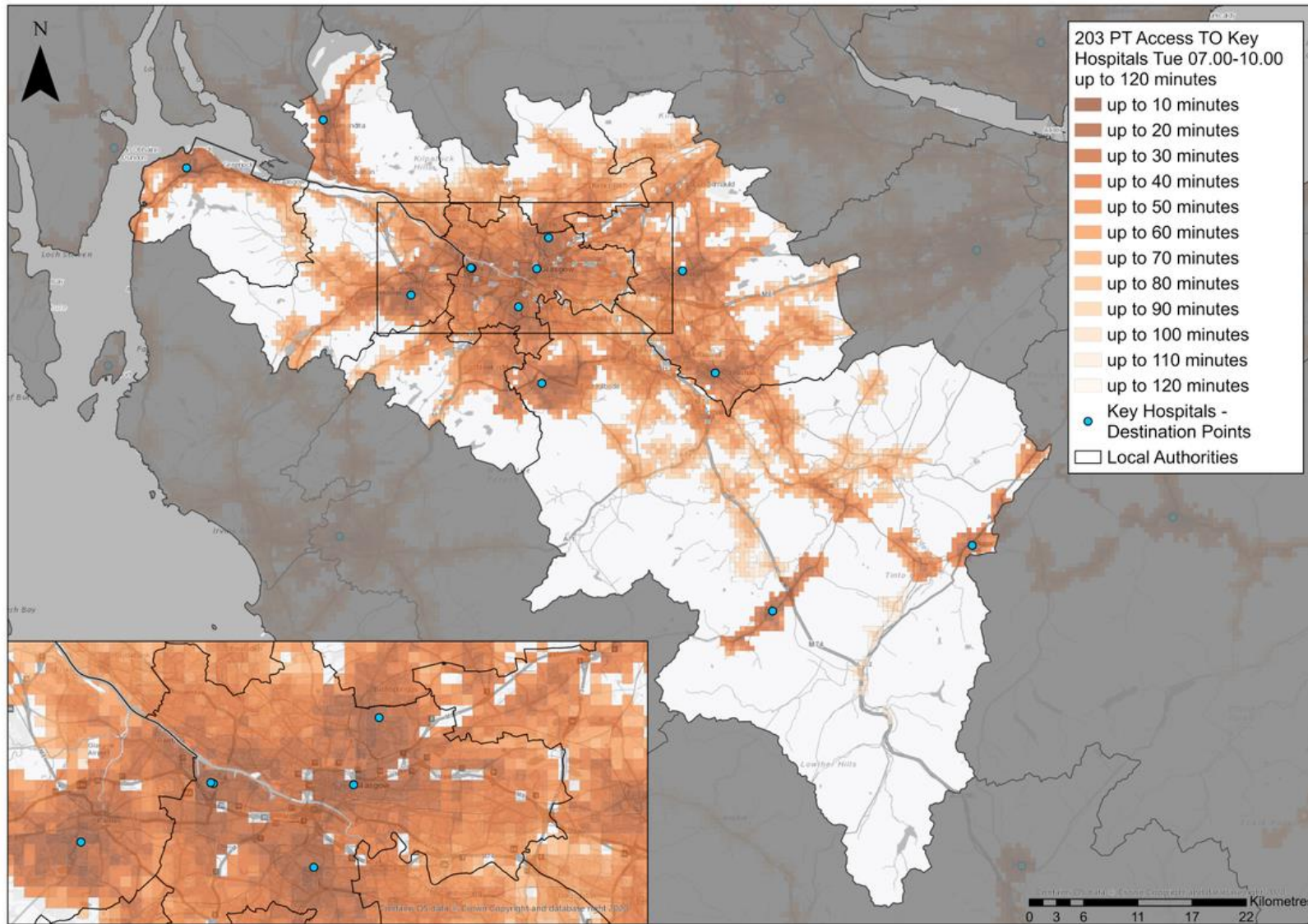


Figure 6: Public Transport to Key Hospitals in the Glasgow City Region, (on a typical Tue 07:00-10:00hrs)

A recent report for the DfT⁹ reviewed the evidence on the links between transport, health and well-being. It concluded that availability of transport, particularly public transport, is invaluable for accessing healthcare. This was particularly the case for older people, who have greater healthcare needs than younger people and more restriction on their mobility. Transport also allows access to non-healthcare activities that are beneficial for physical and mental health, social connection and wellbeing, and the reduction of social exclusion.

Existing Travel Mode Choice

Analysis of how people choose to travel can demonstrate where there is either a lack of access to public transport, and/or where the public transport offering is not providing an effective option for journeys. Figure 7 shows the number of people by zone who are choosing car to travel less than 10km to a destination within the City of Glasgow. It shows a large concentration of car-based trips that are being generated in suburban Glasgow. While some of these are in areas where public transport access, particularly the rail network, is poorer, other areas have relatively good public transport access, but these tend to be radial-corridor focussed (see Figure 2).

Figure 8 outlines the situation with regard to the rail accessibility of Glasgow city centre. The percentage split figure demonstrates the city region (and wider) impact of heavy rail relative to heavy rail's ability to effectively service trips to the city centre from within the city.

⁹ Natcen for Social Research on behalf of the Department for Transport, Transport, health, and wellbeing: An evidence review for the Department for Transport, July 2019
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/847884/Transport_health_and_wellbeing.pdf

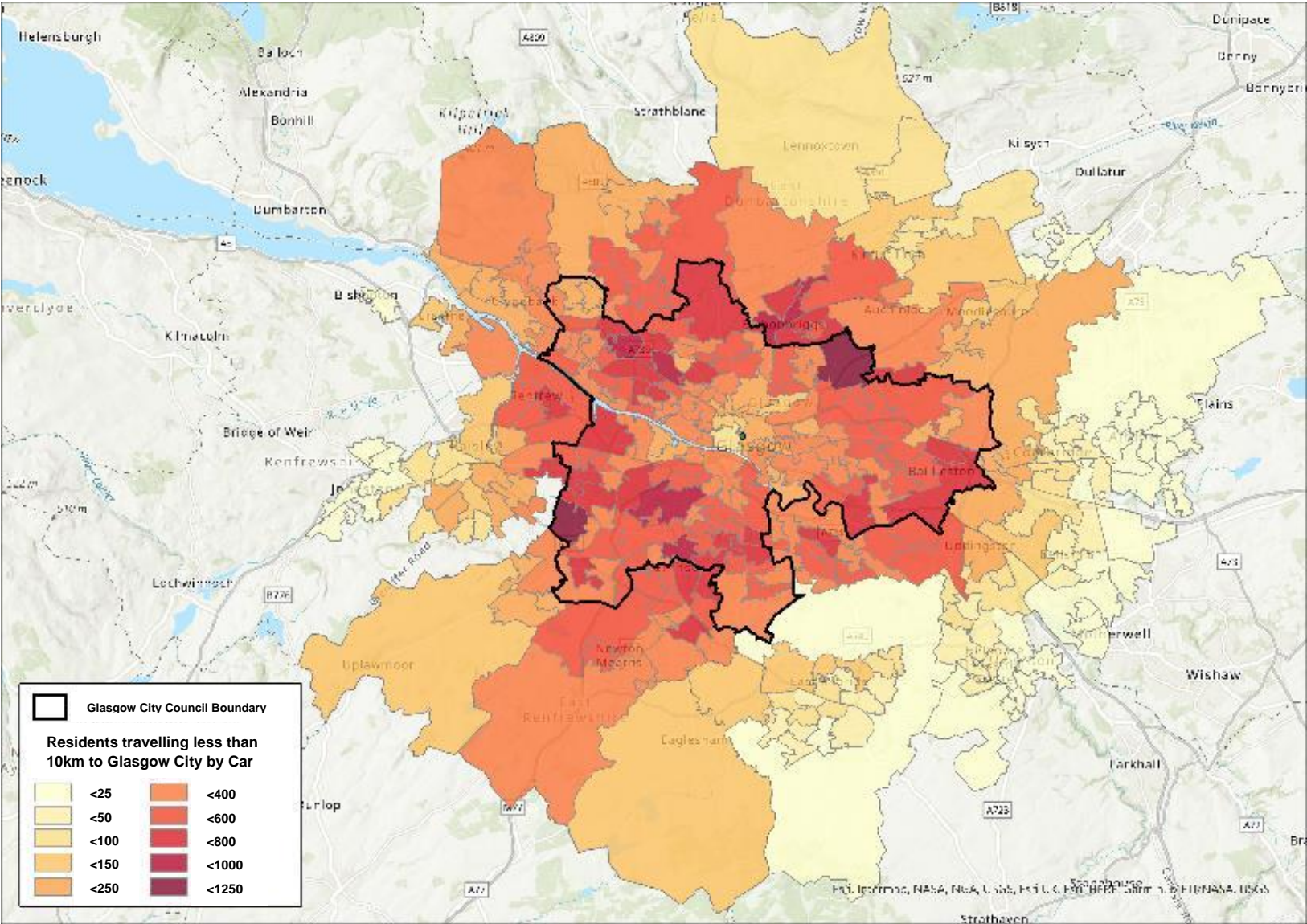


Figure 7: Number of Residents within a Zone travelling <10km to City of Glasgow area by car

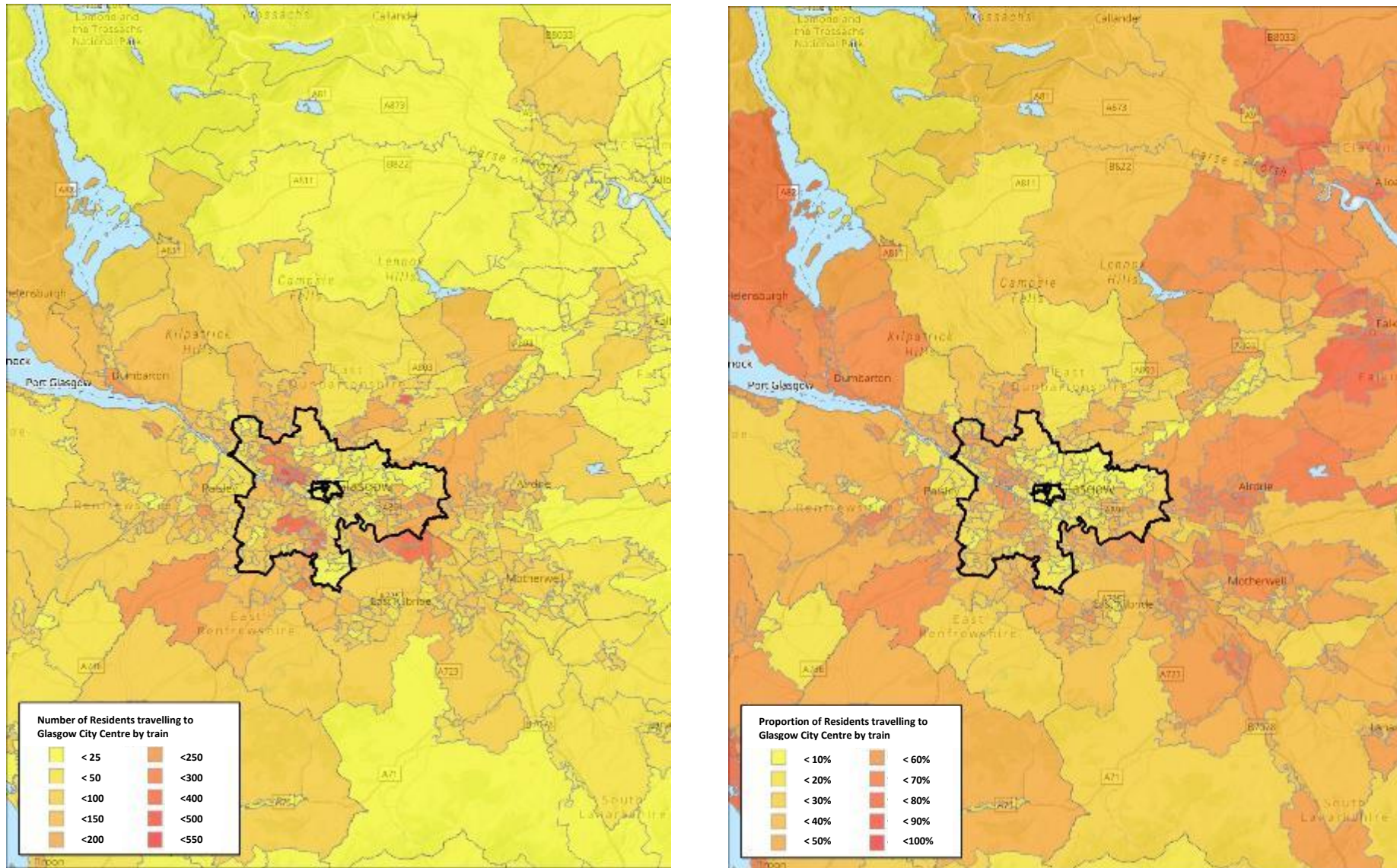


Figure 8: Number of residents from each area travelling to Glasgow City Centre by train (left) and proportion of those travelling from each area to the city centre who do so by train (right)

Rail Network Development

Glasgow and the surrounding area have seen some significant changes in the last 40 years; the population of the City of Glasgow has reduced from just under 700,000 to around 633,000, with the metropolitan population also reducing; albeit at a lower rate, from around 1.73m to 1.67m. In addition, manufacturing industry has reduced from employing around a quarter of the workforce to around 5%, with accompanying changes in the physical form of the city. There have been accompanying changes to the wider city region with the growth in the service sector; focussed around the city centre business district, but an accompanying demand for housing and open space that has driven a growth in commuter behaviour and landscape. Despite the West of Scotland having the largest suburban rail network outside of London, changes to the rail network in that 40-year timeframe have been fairly limited. The Kilmacolm line has closed, the Paisley Canal line has been closed then partially reopened, the Maryhill line has been reopened, as have the Whifflet line, the Argyle line and the Larkhall line. The reopening of disused alignments implies that no new lines have been added to the network. As a result, despite the changes in the city since 1979, fitting new lines into emerging urban forms and connecting these in a meaningful way has not been realised. Public transport connectivity has therefore relied on the bus network developing into these areas and providing a competitive service, yet passenger demand has continued to suffer an overall decline. As passenger numbers decline, the ability to deliver and sustain a meaningful bus network becomes compromised and so services tend to focus on the city centre, key radial corridors and isolated hubs such as the Queen Elizabeth University Hospital. Rail development has however provided enhanced services on the existing (historical) corridors with new and upgraded stations, new modern rolling stock, increased service frequencies and increased passenger capacity, leading to a significant divergence in the quality of public transport offering across the conurbation.

A 2018 study undertaken for Transport Scotland highlighted that Glasgow Central High-Level would be under significant pressure in the peak period (2024) in order to accommodate known growth in services. Historically, action has been taken that has provided relief to Central Station; such as the construction of two new platforms on the previous car parking/drop-off area in (2010) and the electrification of the Whifflet line (2014), which allowed some services to be diverted to Central Station Low Level, with the added connectivity benefits linking through to western stations. While minor changes such as these have provided some relief, there are few if any opportunities for further incremental capacity relief. This has led to current development schemes, such as the East Kilbride line enhancements, having to consider how to deliver their outcomes while minimising impacts on Central. Network Rail's Scotland Route Study notes that: "For Glasgow Central to be able to meet 2043 Conditional Outputs for long distance and commuter services it will need to be adapted to accommodate longer and more frequent trains. Due to changes in the length of modern electric trains, by CP6, a number of the shorter platforms at Glasgow Central will not provide sufficient capacity to meet service requirements and more, longer platforms will be required at the city centre station that is geographically constrained." Whilst it would be possible to facilitate the lengthening of the shorter platforms by reconstructing the bridge girders over Argyle Street and reinstating the bridge deck over the River Clyde, the cost and disruption would be high. The medium term need to

develop additional capacity for new and longer high-speed rail services in Glasgow Central adds further complexity to this issue; it would be possible to extend the station to the east to accommodate these additional services but the cost would be high.

The redevelopment of Glasgow Queen Street Station is providing a modern facility with extended platforms and enhanced passenger circulation space. This work provides the infrastructural support to allow for a forecast 40% increase in passenger use by 2030. This is based on growth on the existing network, particularly the enhanced Edinburgh – Glasgow line. Like Central, Queen Street post-redevelopment will be largely constrained from a physical perspective so it will be unlikely to offer significant opportunities to accommodate new lines or a significant growth in services. Therefore, both of the key city centre terminus stations will be constrained to accommodate planned, shorter term growth but will not be capable of accommodating longer term growth without significant capital expenditure.

As described above, the West of Scotland rail network has historically grown through the reopening of some previously closed lines, but no new routes have been added. Future major development outside of the city centre is likely to focussed on the River Clyde corridor (Clyde Mission), community growth areas, Glasgow Airport Investment Area, and the Innovation Campus/District that are focussed on the Govan area between the Queen Elizabeth University Hospital and Pacific Quay. The historical lack of new line development discussed above makes it even more challenging now to develop new alignments into these areas and, in the overwhelming majority of cases, it is not feasible without substantial disruption, cost and the provision of significant city centre capacity.



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Evidence from benchmarking

A benchmarking exercise has been undertaken to understand what comparable cities in Europe have in terms of their public transport offering across their respective city regions. Thirteen cities have been selected based on factors including population (city, urban area, metropolitan area), geographic location, physical characteristics, historical development, demographics and industrial legacy/economic situation. This also draws on wider benchmarking work undertaken by Professor Greg Clark for the

Glasgow Economic Leadership. In addition, a range of cities with different mixes of transport solutions has been sought to help understand the ways that different modes have been developed and interact with one another as part of an overall public transport system. These cities comprise: Bilbao, Copenhagen, Dortmund, Dusseldorf, Gdansk, Helsinki, Lille, Lyon, Manchester, Newcastle, Nuremberg, Oslo and Rotterdam.

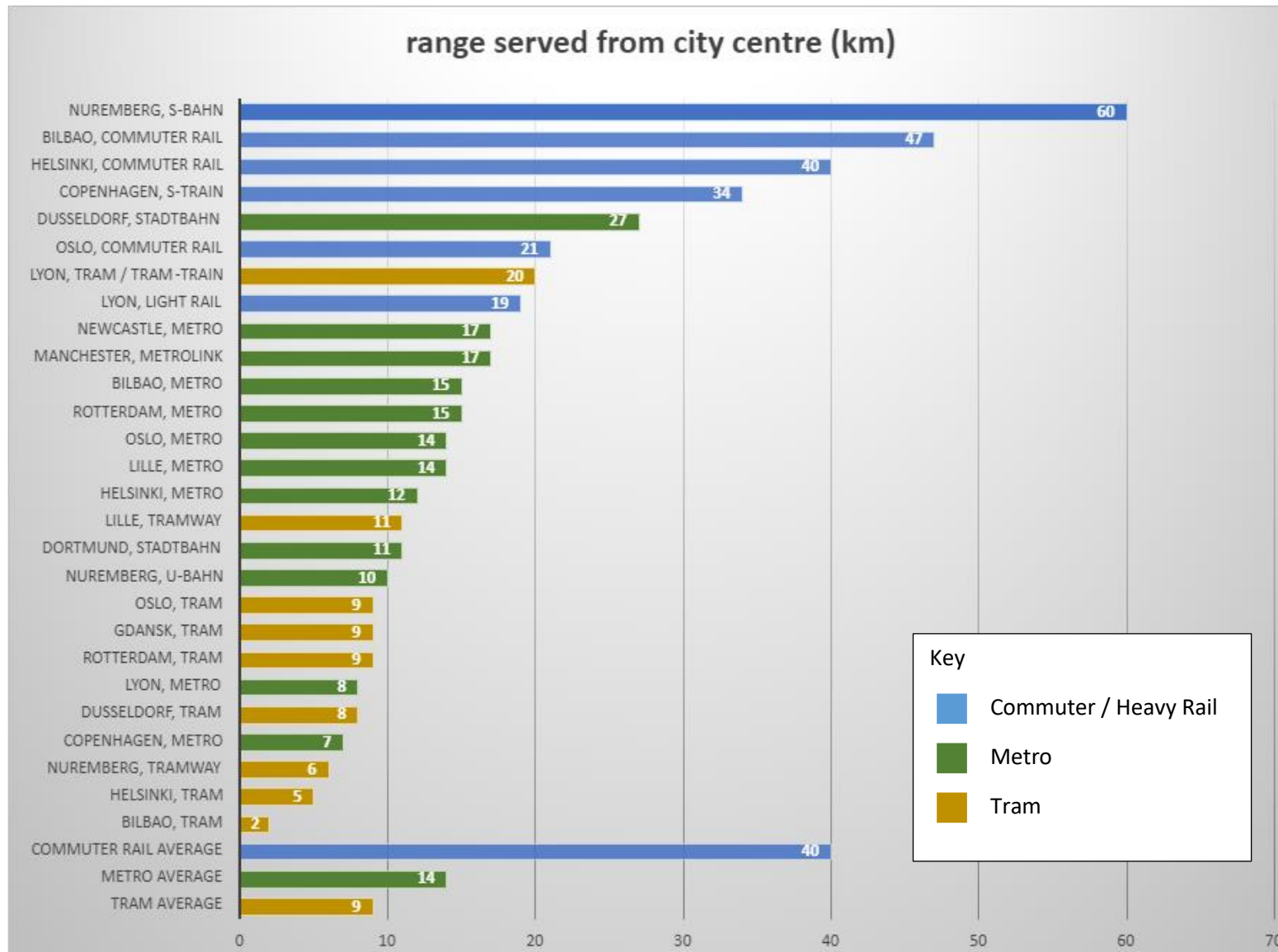


Figure 9: List of comparator European cities with Glasgow and the range (kms) their rail, metro and tram lines serve from their city centres

Analysis of the technical characteristics of the systems in these cities (as seen in Figure 9) shows that suburban/commuter heavy rail line lengths range from around 21km to 60km from the city centre; averaging at 40km. Metro system line lengths range from around 7km to 27km from the city centre; averaging at 14km. Tram system line lengths range from around 2km to 20km from the city centre; averaging at 9km.

The average length for heavy rail lines corresponds well to the suburban rail network serving Glasgow, however a number of the inner suburban rail lines are significantly shorter than the lower bound value (21km). This tends to suggest that heavy rail is operating in a zone where a different tier of public transport would perhaps be more appropriate. Below the heavy rail network in Glasgow, the bus network has limited right-of-way and manages average timetabled speeds (including stops) of around 14kph on major cross-city routes, which is significantly slower than the (approximately) 40kph for the suburban rail network. For comparison, street tram would be expected to operate in the low/mid 20s kph, light rail in the mid 30s kph and light metro at around 40kph. This speed differential with bus results from both (i) more extensive right-of-way and priority for tram/metro, and (ii) fewer stops. In the case studies, bus services generally operate to complement the other public transport networks by (i) linking local areas to stations, (ii) linking between routes, (iii) serving areas that are remote from or difficult to serve by metro/train, and (iv) providing cross city/orbital routes outside of the city centre.

Case Study: Copenhagen

Copenhagen is a city that tends to rank highly in liveability/top city indices; exemplified by the demographic, economic and travel statistics in Figure 10 (overleaf). The city public transport network historically relied on the S-Train system; a heavy rail suburban network that also linked to neighbouring towns, and a city bus network. Copenhagen's Central Station is located on the edge of the historic core and it is a hub for international, national, regional and S-Train services. A key challenge for the proposed Orestad development area was to provide effective public transport connectivity. The Oresund Crossing incorporated a high-speed line serving Copenhagen Airport and connecting east-west across Orestad to link with the southern approaches to Copenhagen Central. The urban form required a north-south alignment but this was problematic to serve using the S-Train as it would be very difficult to achieve a connection into the existing lines at the throat of Copenhagen Central. In addition, the existing S-Train system used a single tunnel through Copenhagen city centre, which left some central areas less well served. In line with development plans and a focus on corridors and transit-orientated development, the legislation associated with Orestad therefore mandated the creation of a metro-type solution. The development corporation considered a street tram, a light-rail solution and a light metro solution, and decided to implement the light metro solution as it generated the best overall cost/benefit ratio, largely due to:

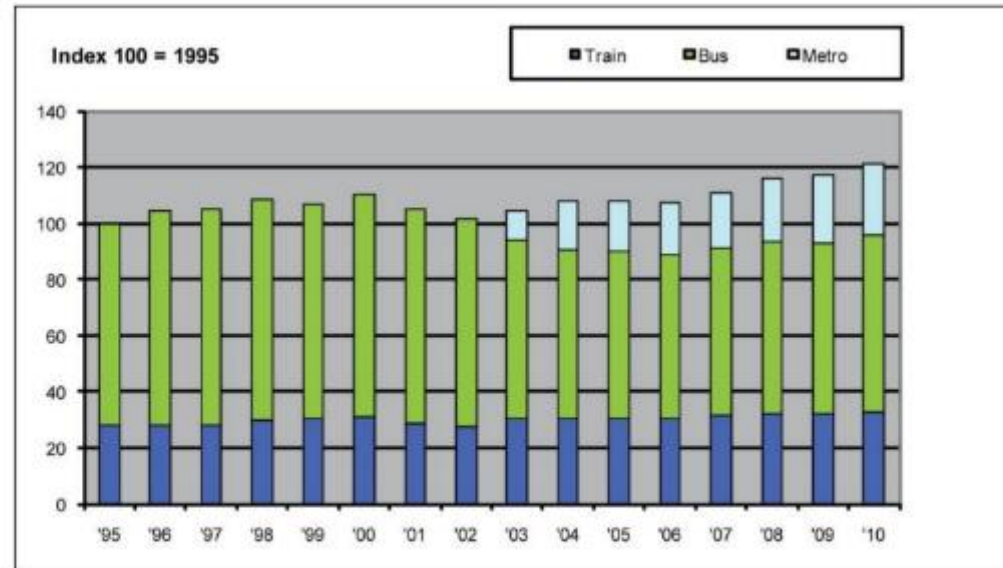
- lack of interaction with road traffic and low risk of incidents;
- high ability to attract passengers;
- highest passenger capacity;
- high frequency services;

- better environmental conditions in terms of noise and vibration;
- higher speed between stops; and
- lower tunnelling costs.

The original line (M1) and spur (M2) began operation in 2002, with an extension (M2) to the airport in 2007. Further lines have since been added to the network including a circular line (M3), a north harbour line (M4) with more planned. Copenhagen Metro carried 44m passengers in 2008, 54m in 2011, and now carries around 79m passengers per annum. A key part of the operating philosophy has been effective integration with the S-Train system. Once the southern extension of Line M4 is complete, including a southern S-Train interchange, it is forecast that the system will carry around 240m passengers per annum. For context Glasgow Subway carries around 13m and the entire ScotRail network carries around 100m. Including the M4 southern extension, the 38km system capital cost is around £5bn at 2020 prices; noting that around 70% is in tunnel and 30% is elevated/at-grade. Figure 11 shows the share of public transport provision in Copenhagen over a 15-year period (1995-2010), illustrating the change in composition following the introduction of the Copenhagen Metro in 2002/03

Change 2005 to 2015	
Population	+15%
Jobs	+12%
Car Ownership	+21%
Car traffic	-3%
Bicycle traffic	+19%
Public transport trips	+14%

Mode Share	2017
Walk	19%
Cycle	29%
Public Transport	18%
Car	34%



Development in public transport in the City of Copenhagen and City of Frederiksberg municipalities 1995 - 2010 (data from the City of Copenhagen municipality).

Figure 10: (Left) Tables highlighting key demographic, economic and travel characteristics of Copenhagen

Figure 11: (Right) Timeline showing the changes in share of train (dark blue), bus (green) and metro (light blue) provision in the City of Copenhagen and City of Frederiksberg municipalities from 1995 to 2010

4 The strategic rationale for Glasgow Metro

The Glasgow conurbation is not achieving its economic potential. The incidence of multiple deprivation, health issues and multi-generational unemployment have created a cycle that is becoming embedded and excluding people from achieving their potential and contributing to a flourishing and vibrant place. Climate change creates an urgent need to tackle carbon, but the just transition agenda has particular resonance for Glasgow. There are many solutions covering a wide range of topics that will need to act in concert to deliver change, and transport has a role to play in this.

There have been various proposals over many years to develop a public transport mode for Glasgow that have been primarily based on serving movements within and across the conurbation. This has resulted in proposals ranging from bus rapid transit (BRT), to tram and light rail types of infrastructure. At the heart of these proposals has been a belief that there is a deficiency in the public transport network that needs to be addressed. In addition, to tackle climate change, it requires a ‘step change’ in modal shift across the city region away from car use and to more sustainable modes.

The West of Scotland has the largest suburban rail network outside of London and, through the ScotRail franchise, operates a heavy-rail system that has been the aspiration of many cities that lacked an effective fixed track public transport network. This network has been critical in delivering commuter flows within the conurbation and particularly to and from Glasgow city centre (34% of people arriving in the city centre do so by rail). The overwhelming majority of this network is based on historical lines developed as part of the conurbation’s industrial and spatial heritage. The value of these lines and the services that can operate on them to link within the city region and beyond is significant. However, the high level of rail use for city centre trips is not mirrored in public transport across the city and the conurbation in general. The difficulty in developing and delivering new heavy railway lines to serve more widespread areas and decentralised developments is substantial, and there is a need for a solution that better links areas of employment to areas of housing. Many cities have tackled this through the development of sub-heavy rail fixed route public transport (BRT, tram, light rail, metro); either expanding on existing historical networks or developing completely new (e.g. Copenhagen Metro). The extent of these systems generally aligns with the contiguous urban area of cities, which for Glasgow would include areas of East Dunbartonshire, East Renfrewshire, North Lanarkshire, Renfrewshire, South Lanarkshire and West Dunbartonshire.

Why now?





- The City Growth Deal, Scotland’s Agenda for Cities and the work of the Scottish Cities Alliance all emphasize the importance of the City Region economy and that effective connectivity is a prerequisite for inclusive economic growth;
- Glasgow City Council’s independent Connectivity Commission developed an overall strategic vision for the future of transport in and around Glasgow that called for, “the creation of a comprehensive Glasgow Metro for the city.”;

- Almost three-quarters of those living in the City of Glasgow travel less than 10km to work but car accounts for 47% of these journeys;
- 56% of households in Glasgow have no car and rely on walking, cycling and public transport, so access to new employment opportunities, such as Clyde Mission will rely on an effective public transport solution;
- The heavy rail network remains a success story, but capacity has struggled to keep up with increases in demand;
- Overall capacity at the city centre terminus stations will constrain heavy rail growth
- Glasgow City Council's city centre strategy is seeking to remove traffic from the city to create better places for people and to double the city centre resident population. Maintaining city centre accessibility with these changes and the low emissions zone will require higher capacity public transport solutions;
- At the same time as rail patronage has been increasing, bus patronage has been decreasing;
- Bus use is highest in the 20% most deprived areas in the country, which are in Glasgow, but journey time to key employment areas can be significant;
- Deprivation is relatively high in the Glasgow City Region with health, education and employment all relatively poor compared with other comparable regions, some of these areas have relatively good transport links so the contributory factors are more complex;
- New suburban and peri-urban development has in many cases been difficult to serve from the existing historical rail network and this has fuelled car use. Metro can support the establishment of 20 minute neighbourhoods;
- Many current and future development areas, particularly along the Clyde, are not served by the existing railway network and lack wide network connectivity and accessibility. Metro is likely to be important in realising the ambitions of Clyde Mission; and
- The M8, M74, M77 and M80 all suffer from significant peak hour congestion and tackling this with modal shift will require a 'step-change' in capacity, accessibility and destinations served.


The policy context also supports taking action now. NTS2 sets out four priorities around reducing inequalities, taking climate action, helping to deliver inclusive economic growth and improving our health and wellbeing. The Metro concept supports all of these priorities.

While the transition to electric vehicles will make a significant impact on emissions, substantive impact will still require modal shift. In addition, tackling congestion in our cities will require more capacity in alternative modes; active travel and public transport. This is particularly the case in providing more sustainable access to and through Glasgow city centre. Metro supports the transition to net zero.

5 Meeting the STPR2 Transport Planning Objectives¹⁰

TRANSPORT PLANNING OBJECTIVE	CONTRIBUTION	SCALE OF IMPACT (-3 to +3)
 <p>A sustainable strategic transport system that contributes significantly to the Scottish Government’s net zero emissions target.</p>	<p>The analysis contained in the case for change report and benchmarking against comparable cities in Europe demonstrates a gap in the public transport hierarchy. Metro provides an opportunity to target people who currently choose to use car due to either a perceived or actual lack of effective alternative. It is envisaged that Metro modes will be electric/battery/hydrogen powered from the outset; delivering low emission travel.</p>	<p>✓✓✓</p>
 <p>An inclusive strategic transport system that improves the affordability and accessibility of public transport.</p>	<p>One priority for Metro is to target areas that are not currently served by the commuter rail network and are relatively poorly linked by other transport modes to key employment, education and retail hubs. Many of these areas correlate with higher levels of deprivation, low levels of employment and lower educational achievement. It is unknown what the fares structures would be at this time hence it is not known how comparably affordable it would be.</p>	<p>✓✓</p>
 <p>A cohesive strategic transport system that enhances communities as places, supporting health and wellbeing.</p>	<p>The implementation of Metro gives a major opportunity both around the linear infrastructure and at stations/stops to support placemaking, and in particular the formation of local hubs. Integration with walking and cycling for journey start and end will also be important.</p>	<p>✓✓</p>
 <p>An integrated strategic transport system that contributes towards sustainable inclusive growth in Scotland.</p>	<p>By integrating Metro with emerging growth programmes such as Clyde Mission and Innovation Zones, as well as existing rail and bus modes, Metro could provide a step-change in spatial accessibility that will significantly contribute to sustainable economic growth.</p>	<p>✓✓✓</p>

¹⁰ All of these impact assessments are currently underway but no formal assessments have yet been undertaken. Please note SEA and EqIA scoping reports have been produced and consulted upon.

 A reliable and resilient strategic transport system that is safe and secure for users.	<p>By providing a ‘step-change’ in capacity and new facilities, it is envisaged that Metro will add significant resilience to Glasgow’s public transport network. In addition, the controlled and modern nature of these systems tends to result in high levels of reliability. New infrastructure gives the opportunity to include modern safety and security systems from the outset.</p>	<p>✓</p>
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6 Addressing the Post Covid-19 Priorities

POST-C19 PRIORITIES	CONTRIBUTION
Employment	Corridors and alignments will be planned to target improving accessibility for journeys to work. In particular, Metro presents an opportunity to gain access to areas that are remote from the existing heavy rail network, and where bus does not provide a desirable option.
Environment	Provides capacity for modal shift from shorter distance car journeys within the city and its environs. Establishing Metro corridors gives the opportunity to reinforce local placemaking and townscape enhancements through the improved design of Metro corridors and stations/stops. Through modal shift, the intervention will also help reduce greenhouse gas emissions and improve air quality.
Education	Major education hubs represent significant nodes for potential Metro services. The accessibility of major further and higher education campus facilities is a driver for the development of Metro routes.
Equalities	As 56% of households in Glasgow have no access to a car, improvements in public transport have a disproportionately high positive impact on households that are at a socio-economic disadvantage. In addition, the provision of new facilities will by definition require to be fully accessible.

7 Risk and Uncertainty

A number of risks and uncertainties will need to be considered as the Metro works through the various stages of appraisal and business case development. Many of these will link to technical aspects, interface and construction, statutory processes, public relations, environment and others. The table below sets out some key areas of risk and uncertainty that should be considered at this stage, which will be reviewed and revised as further development of the intervention adds more detail to potential Metro networks, phasing and technologies.

RISK / UNCERTAINTY	DESCRIPTION
<p>Travel pattern changes following COVID-19</p>	<p>The ongoing COVID-19 pandemic and its restrictions have changed travel patterns and mode choice in the short term. It is not yet understood what the impacts will be in the longer term. Much of the travel in the region is directed towards Glasgow City Centre and this may return to previous levels or it may change in the longer term with more activity in tier 2 centres, e.g. Paisley, Braehead, East Kilbride, Hamilton, Patrick, Shawlands, Coatbridge, Bishopbriggs Clydebank, etc. I.e. people may make more use of smaller centres that are closer to their home. Additionally, attitudes towards public transport may change which could present a wider problem for the aspirations of the NTS but also challenges for a viable metro network.</p> <p>This may undermine a business case for metro that is focused purely on City Centre access. However, within the Glasgow City Region Case for Change it is acknowledged that cross region movements are an area that require consideration for improvement and a number of the key attractors in the region, e.g. Universities, Hospitals, the Airport are not in the City Centre. Whilst the impact of travel pattern change cannot be ignored it does not rule out the value of a metro network for the region in providing cross region links and links to key attractors.</p> <p>The timescales to develop a metro network are lengthy and work to understand the potential network can progress whilst further information about post COVID-19 travel is gathered.</p>
<p>High Speed Rail</p>	<p>The development of the HS2 network in England will include running high speed trains to Glasgow from day one on the existing network north of the dedicated high-speed lines. There is also the potential for further development of the high-speed network into Scotland, and both these situations are likely to place greater pressure on the capacity of the rail network including at Glasgow Central. Solutions to these pressures will not be quick or cheap and Metro may have a role to play in</p>

RISK / UNCERTAINTY	DESCRIPTION
	alleviating pinch points on the approaches to Glasgow.
Economic Recovery and Public Sector Funding	Metro solutions would be expected to require substantial funding and operational / delivery models would have to be considered as part of further assessment. It is acknowledged that the pressures on the public sector budgets may become more acute in the efforts to recover from the COVID-19 pandemic and its associated public funding support packages.
Integration with other modes and with the wider STPR2	Glasgow has a number of transport networks and any new provision would have to integrate with these. Additionally, STPR2 is likely to recommend large changes to the key networks in and around the region which will add additional complexity for metro planning.
Delivery and Operating Models	Similar to many of the systems in the benchmarking exercise, it is envisaged that any metro system for the Glasgow area would be delivered over multiple years and consist of a number of individual lines. The system would also comprise of infrastructure, rolling stock and systems that all require linked procurement. In addition to the delivery model aspects, an operating model for the metro will be required that is aligned with stakeholder outcomes and is sustainable.

8 SEA, EqIA and other Impact Assessments

ASSESSMENT	COMMENTARY
SEA (Strategic Environmental Assessment)	Modal shift from car to Metro would result in reduced greenhouse gas emissions and improved air quality. There are potential localised negative impacts on the Population and Human Health SEA topic (noise and vibration, construction dust, accessibility and visual impacts) but with effective design and construction Environmental Management Plans in place, this intervention is likely to ultimately complement the SEA and help progress the SEA objectives. Effective placemaking and streetscaping design would also provide environmental mitigation and potential enhancements in the operational phase.
EqIA (Equality Impact Assessment)	New stations/stops will require to be fully accessible and there will be an opportunity with new infrastructure to design-in step-free access.
ICIA (Island Communities Impact Assessment)	n/a
CRWIA (Children’s Rights and Wellbeing Impact Assessment)	Depending on final alignments, Metro may provide improved access to education for children and young people. New alignments may provide enhanced opportunities and access to education facilities (even over a relatively short distance), in the context of a modern, safe and reliable system.
FSDIA (Fairer Scotland Duty Impact Assessment)	Work contained in the Glasgow City Region Case for Change report demonstrates the challenge; particularly in the City of Glasgow around SIMDs and the significant number of people who are at a socio-economic disadvantage. The need to improve connectivity and accessibility to higher quality public transport for many of these areas will be a major driver for the development of routes. It is anticipated that the Metro will have a net positive benefit in this regard.

9 Implementability and Interdependencies

IMPLEMENTABILITY CRITERIA	COMMENTARY
Feasibility	Depending on route alignments there is potential for conversion of existing/abandoned railway alignments and reallocation of road space on wide radial road alignments. The City Centre street grid is well suited to potential on-street operations. Conversions of heavy rail services/alignment will require careful phasing. Any bus rapid transit elements are likely be easier to deliver depending on route alignments.
Affordability	Likely to be delivered in multiple phases over a significant time period (e.g. Manchester Metrolink has developed over 30 years and continues to be developed further). Metro may involve a mix of modes ranging from bus rapid transit through to heavy metro; with a consequent range of implementation costs. Has the potential to negate the need for costly investment in increasing heavy rail capacity and at the same time deliver wider benefits.
Public Acceptability	Investment in high quality public transport facilities generally enjoys a high degree of public support. Where new systems have been introduced (e.g. Copenhagen Metro, Manchester Metrolink), they have proven popular and there has been substantial public pressure for system expansion. On an individual line basis, there are likely to be specific impacts that will require mitigation.

Key Interdependencies

The interaction of Metro with the bus network at a local level, and the railway network at a strategic level, are major interdependencies. The interaction with the rail network presents the greatest challenge from a technical perspective as decisions on new rail services and capacity enhancements may directly impact on (or be impacted by) the way in which Metro is developed. There are also interdependencies relating to the development of urban active travel corridors where it may be desirable to deliver these in tandem with a linear Metro corridor, or alternately avoid physical interaction by ensuring different routing for these facilities.

Land use changes will also impact on Metro including the current Clyde Mission which could see new investment along the Clyde corridor and City Region Deal developments such as Barclays Glasgow Campus, the expansion of the Scottish Events Campus (SEC), the Glasgow Riverfront Innovation Campus, along with the Advanced Manufacturing Innovation District and Queens Quay which could change travel demand in and around the Region.

10 Summary

Glasgow Metro has a key role to play in tackling social exclusion, access to jobs and supporting national-level priorities such as Mission Clyde. In addition, it will provide significant capacity for modal shift and the journey to achieving net zero emissions. By targeting the 'missing tier' of public transport, Glasgow Metro will provide an opportunity to relieve key heavy rail constraints; meaning that bus, metro and rail systems are focused on serving their key markets and achieving the transport outcomes for which they are best suited.

Transport Scotland will develop the concept of Glasgow Metro through STPR2 Phase 2, engaging with regional partners and the local authorities Glasgow Metro Project team.

