



Availability of communications
services in UK cities
Summary Report

Research Document

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About this document

This document sets out a high-level analysis of the availability of communications services in UK cities. It summarises and updates the work Ofcom has published so far in this area, introduces the latest research we have commissioned and sets out our plans for further work during the rest of the year.

In May 2013, Ofcom published a report on the Availability of Communications Services Across the UK,¹ which largely focused on the differences between urban and rural areas, particularly in the nations.

While there has been a great deal of public interest in the availability of communications services in rural areas, relatively little work has been done to consider availability in built-up urban areas, which account for 80% of the UK population.²

This report shows that there are still significant gaps in the availability of standard and superfast broadband services in sample UK cities, and proposes a range of possible explanations for this.

During 2014, Ofcom expects to supplement this work with analysis of broadband take-up in cities as part of the Communications Market Report and will consider any emerging policy implications in our annual Infrastructure Report, which we expect to publish in September 2014.

¹ <http://stakeholders.ofcom.org.uk/binaries/research/markets-infrastructure/economic-geography.pdf>

² <http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>

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Section 1

Executive summary

This report contains key findings on the availability of communications services in UK cities and the factors driving this. It complements analysis we published in May 2013 on the availability of communications services in the UK. This work showed that rural areas often fare much worse than urban areas for the availability and speed of fixed broadband internet access. In part, this is because the costs to operators of extending the infrastructure are often higher in rural areas where population density tends to be lower and/or topography is more challenging.

While cities are generally well served by fixed and mobile broadband services, particularly when compared to rural areas, there were significant variations between the 11 cities we assessed³ in terms of the proportion of standard broadband connections that were not delivering a speed above 2Mbit/s and next-generation access (NGA) broadband coverage.

For example, an average of 4.1% of premises in the cities we surveyed could not connect to a service that exceeded 2Mbit/s with the highest proportion in Derry~Londonderry (9%), Cardiff (8%) and Inverness (8%). Similarly for NGA availability, Belfast and Derry~Londonderry stood at 98% and 99% respectively compared to 67% in Glasgow and only 2% in Inverness.

Analysing the potential factors driving these differences is complex with the differences often highly localised and also varying between cities. In this report we look at income deprivation as a potential factor. We looked at 6 cities in more detail and found that in the majority of them, areas of greatest income deprivation also had a higher proportion of connections with speeds of less than 2Mbit/s than the rest of the city. One reason for this may be because people living in these areas are less able to afford to upgrade their broadband service to NGA where it is available.

The most income deprived areas of the city were also those where NGA broadband was often least available. One reason for this could be that operators are rolling out NGA services to higher income areas first in order to maximise revenue.

In some cities, however, geographical factors appear to take precedence over income deprivation. In Cardiff, for example, the northern and western parts of the city, which are among the least deprived areas of the city, have both lower NGA availability than the rest of the city and a high proportion of connections with speeds of less than 2Mbit/s. This may be because these areas are more rural and suburban, which can make it more expensive for operators to roll-out NGA infrastructure. Similarly, the distance between premises and the local exchange are likely to be longer which increases the likelihood of slower broadband speeds.

Overall, broadband availability in cities is affected by a complex combination of factors on both the supply and demand side which are strongly driven by the specific nature of each individual city. As operators continue to rollout NGA services to greater numbers of premises and new technologies become more widely available, it is reasonable to expect that NGA availability should increase in the cities we have studied. This should then give some consumers suffering from standard broadband lines below 2Mbit/s an alternative broadband option. However, ultimately it is important to recognise that slow broadband and lack of NGA

³ These cities were: London, Birmingham, Manchester, Cambridge, Exeter, Glasgow, Inverness, Cardiff, Bangor, Belfast and Derry~Londonderry.

availability are not just problems of rural areas and a significant minority of people in urban areas are affected too.

Section 2

Introduction

Ofcom's principal duty is to further the interests of consumers and citizens in communications matters. One of the ways we do this is to undertake and publish research into the markets we regulate.

In Ofcom's 2013/14 Annual Plan, Ofcom identified the importance of understanding infrastructure availability with respect to geography:

In 2013/14 we will undertake further research into the effect of communications infrastructure availability on geographic areas. This research will be used together with the conclusions of our work on the availability of communications services in the nations (Economic Geography) which we will publish shortly. This existing research focused on rural and lower-density geographies; our follow-up work will complement this by focusing on higher-density areas, including cities and towns

Ofcom's report on the Availability of Communications Services Across the UK found that there are significant variations in the availability and speed of fixed broadband services. The variations are most evident between urban and rural areas, and also between the different nations and regions of the UK. In part, this is because the costs to operators of extending the infrastructure are often higher in rural areas where population density tends to be lower and/or topography is more challenging.

In order to assess the availability of communications services in cities, we have undertaken three distinct pieces of research, which set out how the availability of communications services differs between cities and what factors are driving this.

The remainder of this report is structured along the following lines:

- Section 3 describes the key findings from our research into the availability of communications services in 11 UK cities, which we chose to reflect a range of demographic and economic characteristics.
- Section 4 analyses the availability of communications services in six major UK cities against selected socio-economic factors.
- Section 5 contains our emerging conclusions in this area.
- Section 6 sets out our next steps following this report.
- Annex 1 describes the key findings from our research into the availability of communications services in six international cities, which we published alongside the International Communications Market Report in December 2013.

Section 3

Availability of communications services in UK cities

3.1 Methodology

Ofcom commissioned 11 UK city case studies to explore the availability of communications services. The 11 cities we chose to study are listed below. They were chosen to represent a range of urban populations across the UK, different business profiles and to include all the UK nations.

- **England:** London, Birmingham, Manchester, Cambridge, Exeter
- **Scotland:** Glasgow, Inverness
- **Wales:** Cardiff, Bangor
- **Northern Ireland:** Belfast, Derry-Londonderry.

The key findings of this research were published in Ofcom's Communications Market Report (CMR) on 1 August 2013 alongside the full report, which can be found on Ofcom's website.⁴ We have since updated some of this research with data from our 2013 Infrastructure Report.

In order to adopt a consistent approach to defining a city area, the boundary for the relevant local authority was used where possible. Such boundaries existed for all but two of the 11 cities assessed; Inverness and Bangor. In these cases, we used a bespoke approach: for Inverness we selected appropriate Data Zones, which are widely used by local authorities across Scotland, and for Bangor, we selected relevant Lower Super Output Areas, which are widely used by local authorities across Wales.

The percentage of city premises that have access to NGA⁵ provided by BT and/or Virgin Media was estimated by combining a postcode-level dataset for current and future BT NGA with a postcode-level dataset for premises serviceable by Virgin Media's cable network, as provided by Virgin Media. This data only shows premises that have access to NGA services; it does not reflect how many households have actually taken-up such a service.

The proportion of broadband connections with speeds less than 2Mbit/s was calculated using data from Ofcom's Infrastructure Reports published in 2012 and 2013. This data shows the proportion of premises receiving broadband over their telephone line at speeds of less than 2Mbit/s.

The benchmark chosen to compare availability of Wi-Fi infrastructure between cities was number of hotspots per (10,000) city residents. Since the largest providers of Wi-Fi infrastructure in UK cities are currently BT and The Cloud, the total number of hotspots for these two providers was used as a benchmark to compare Wi-Fi availability between cities.

⁴ <http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr13/uk/>

⁵ NGA is a term used to describe a collection of fixed technologies which can improve attainable broadband speeds. These technologies include cable, FTTC and FTTP. Superfast broadband is a sub-set of NGA lines where the downstream speed of the connection is 30Mbit/s or more.

The number of BT Openzone Wi-Fi and Cloud hotspots for each city was mapped to the city boundaries.

3.2 Summary of initial findings

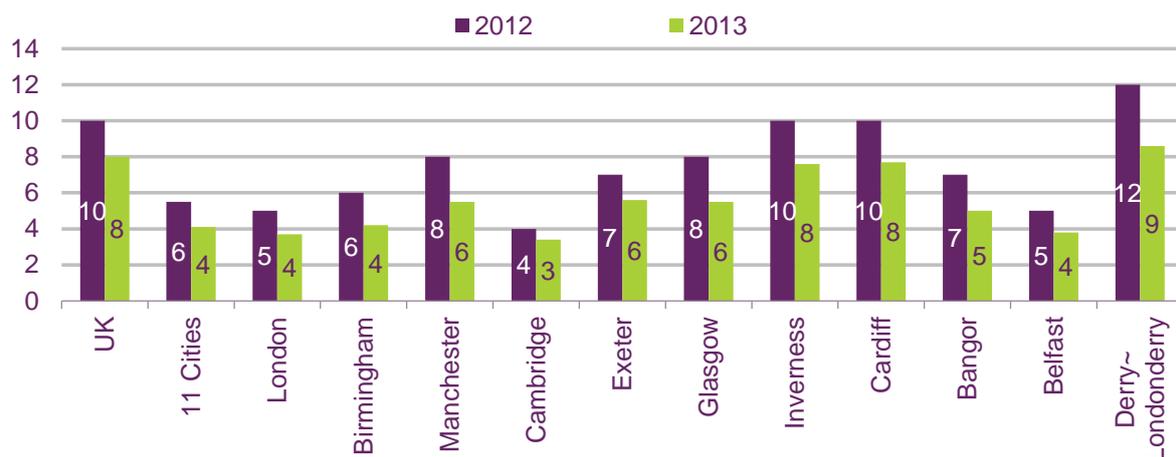
Conventional wisdom suggests that availability of communications services in cities is extensive and of a high quality. The data we published in August 2013, and updated in 2014, challenged this position in a number of areas. We identified four key findings from the work:

- While basic broadband was available everywhere in the cities surveyed, around 4% of premises were unable to receive a speed faster than 2Mbit/s.
- NGA availability was generally close to or in excess of 90% among the cities surveyed, although we found two exceptions to this trend in Glasgow and Inverness.
- Wi-Fi availability appeared to be higher in smaller cities.
- 3G coverage across cities was generally good with coverage from all four mobile network operators.

All the cities assessed had good access to basic broadband services, but around 4.1% of premises in the cities we surveyed were unable to receive a speed faster than 2Mbit/s. This fell 1.4 percentage points from 2012.

The availability of first-generation broadband infrastructure provided by BT was universal across all the cities assessed. However, an average of 4.1% premises could not connect to a service that exceeded 2Mbit/s with the highest proportion in Derry~Londonderry, Cardiff and Inverness. Across the UK, including rural areas, 8% of premises were unable to connect to a service in excess of 2Mbit/s. The proportion of '<2Mbit/s' connections had fallen across all the cities assessed since 2012, which is likely due to increased take-up of NGA broadband services.

Figure 1.1 Proportion of connections with speeds less than 2Mbit/s



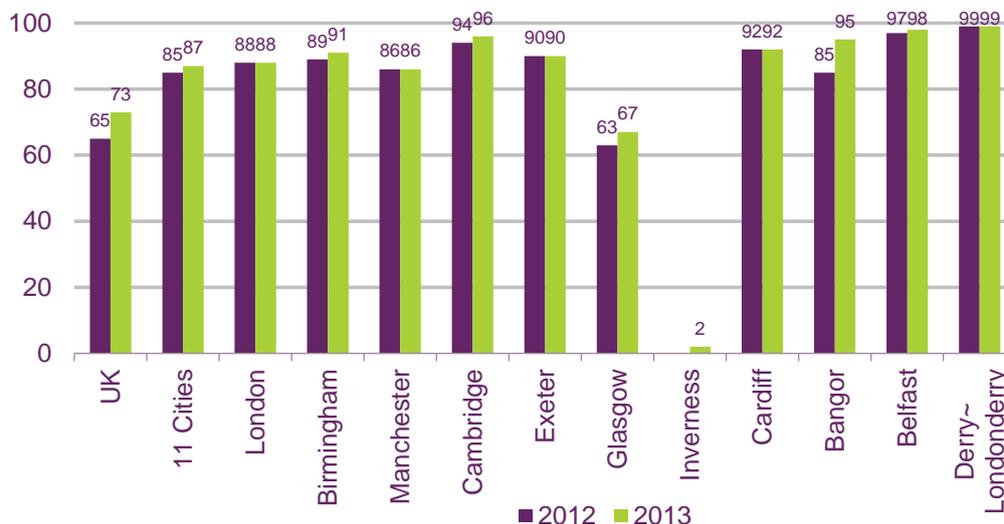
Source: Ofcom Infrastructure Report 2012, 2013

In the majority of the 11 cities, availability of NGA services from either BT and/or Virgin Media was found to be close to or in excess of 90%. Across the 11 cities, availability has increased by an average of two percentage points since 2012

Availability was still below 80% in Glasgow and Inverness, although planned increases in availability in Glasgow will take the city above the 80% mark in the near future. Inverness will

also benefit from the Highlands and Islands Enterprise (HIE) £146 million investment in broadband. Derry~Londonderry's exceptionally high figure reflects the marked effect of the public-sector intervention that has driven availability to 99%, the highest of any city. Similarly, the 10 percentage point increase in NGA availability in Bangor was likely driven by the Superfast Cymru scheme, a project that will see fibre-based broadband extended to 96 per cent of homes and businesses in Wales by the end of 2015.⁶

Figure 1.2 Estimated current availability of NGA infrastructure from BT and/or Virgin Media



Source: Analysys Mason, Ofcom Infrastructure Report 2012, 2013

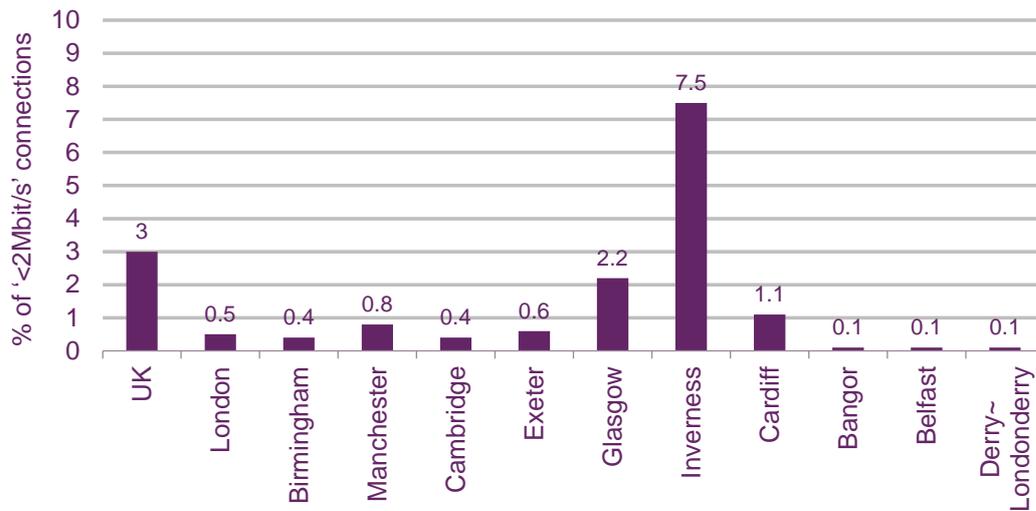
In eight of the 11 cities, less than 1% of premises which received a speed less than 2Mbit/s were in areas where NGA was unavailable

Our analysis shows that when connections in postcodes where NGA was available are excluded, the percentage of connections operating at below 2Mbit/s drops to less than 1% in the most cities. The most notable exceptions to this are Glasgow and Inverness which is most likely explained by the low NGA availability in these cities compared to the others we assessed.

This demonstrates that while most connections of less than 2Mbit/s were able to upgrade to an NGA service, they were choosing not to do so. We suggest some explanations for this in Section 4.

⁶ We have not been able to obtain a reliable NGA availability figure for Cardiff in 2013. We have therefore assumed that NGA availability in the city remains the same as 2012.

Figure 1.3 Proportion of connections with speeds less than 2Mbit/s in postcodes where NGA is not available



Source: Analysys Mason, *Ofcom Infrastructure Report 2013*

The availability of public Wi-Fi hotspots varies considerably across cities, and was often greater in smaller cities

Bangor and Inverness had the greatest number of public Wi-Fi hotspots per head, despite having a smaller number in absolute terms. This may be because small cities have a more easily discerned and identified centre, whereas sprawling cities have multiple centres, or a greater ratio of population to central hubs. The high number for Bangor may also be due to its large student population. However, Derry~Londonderry bucks this trend as a small population with a very low number of hotspots per 10,000 residents.⁷

The wide availability of public Wi-Fi hotspots in cities could serve as a substitute to other methods of internet access, especially in cities with large city centre dwelling populations and among 'light' internet users using mobile broadband or tethering devices to a mobile phone connection. However, Wi-Fi hotspots are unlikely to serve as a suitable substitute for more network intensive activities such as streaming television programmes or online gaming. Wi-Fi hotspots could also serve as alternative network for over-the-top communication,⁸ especially among smartphone users and whilst indoors.

⁷ We have chosen to measure the availability of public Wi-Fi hotspots by population. The data therefore does not reflect geographical factors that may influence Wi-Fi availability.

⁸ Over-the-top communications methods could include VoIP calling, emailing, instant messaging and social networking.

Figure 1.4 Hotspots per 10,000 city residents (hotspots provided by The Cloud and BT) in 2013

City	City total	Total hotspots per 10,000 city residents (city benchmark)	Total hotspots per 10,000 city residents (11 city average)	Percentage difference from 11 city average
London	3220	4.1	6.2	-33%
Birmingham	350	3.4	6.2	-45%
Manchester	278	5.6	6.2	-10%
Cambridge	84	6.7	6.2	+8%
Exeter	64	5.4	6.2	-13%
Glasgow	350	6	6.2	-3%
Inverness	30	8.1	6.2	+31%
Cardiff	240	7.1	6.2	+14%
Bangor	21	14.1	6.2	+129%
Belfast	150	5.7	6.2	-8%
Derry~Londonderry	20	1.8	6.2	-70%

Source: Analysys Mason 2013

All cities had good 3G mobile coverage and most were covered by all four operators

In all cities except Bangor and Derry-Londonderry, all four competing 3G mobile networks provided coverage to the vast majority of premises (98% or more). Only one city, Derry-Londonderry, had premises which were not covered by any mobile operators, although this affected only 2% of premises. However, while availability data provides an indication of network coverage it does not reflect the entire consumer experience of using these networks. Factors such as network congestion, mobile data speeds and the prevalence of dropped calls will also have an impact.

Section 4

Analysis of availability against selected socioeconomic factors

4.1 Introduction

Following publication of our findings in the 2013 CMR we decided to do further work to try and identify the drivers of availability in key cities across the UK. The core of this additional analysis was based around testing the hypothesis that a relationship might exist between socio-economic deprivation and the proportion of broadband connections with a speed of less than 2Mbit/s and the availability of NGA. For this analysis we focused on six of the initial 11 cities: London, Birmingham, Manchester, Glasgow, Cardiff and Belfast. These cities were chosen because of the greater number of data points available from cities of their size, and it also ensured that we represented each of the UK nations.

The data for income, crime and education levels was taken from the Government's Index of Multiple Deprivation (IMD). We chose three of the seven factors available based upon hypotheses which we considered would be most likely to show a correlation with our availability data. We commissioned Analysys Mason to undertake this research for us.

4.2 Methodology

The results for each city are broken down by quartile. Analysys Mason applied two alternative quartile analysis methods, which are summarised in Figure 1.5 .

Figure 1.5 Description of quartile analysis methods used

Method	Description	Example
Equal domain range	This method defines each quartile as the difference between maximum and minimum values of scores in the IMD domain divided by four. The upper and lower scores of each quartile will be different for each city depending on its range of scores for the given IMD domain. Therefore, the number of premises in each quartile will be different. This method highlights acute deprivation relative to the rest of the nation.	This method highlights the NGA broadband availability for areas of the city that fall into the 25% most deprived areas.
Equal premises count	This method defines each quartile as the total number of premises in a city divided by four. Therefore, the number of premises in each quartile will be the same. This method highlights the relative differences in deprivation within a city.	This method highlights the NGA broadband availability for areas that represent the 25% most deprived premises in the city.

Source: Analysys Mason 2014

In their report, Analysys Mason presented findings from both quartile analysis methods. However, for the purpose of making comparisons and observing trends between the six cities, Analysys Mason have used findings based on the *equal domain range* method in order to highlight better those areas with the most acute deprivation. In most cities, there is a large gap between the maximum and minimum values of scores in the IMD domain with most households clustered around the average values. This means that the number of premises in the lowest quartile (the households whose deprivation level is within the range covered by the lowest 25% of IMD domain values) can often be very low. In Glasgow, for example, only 1.3% of premises fell into the most income deprived quartile. In our analysis, we have chosen to use findings based on the *equal premises count* as, by including an

equal number of premises in each quartile, it is easier to compare how availability differs within a city.

4.3 Summary of key findings

The key findings based on analysis by equal premises count are:

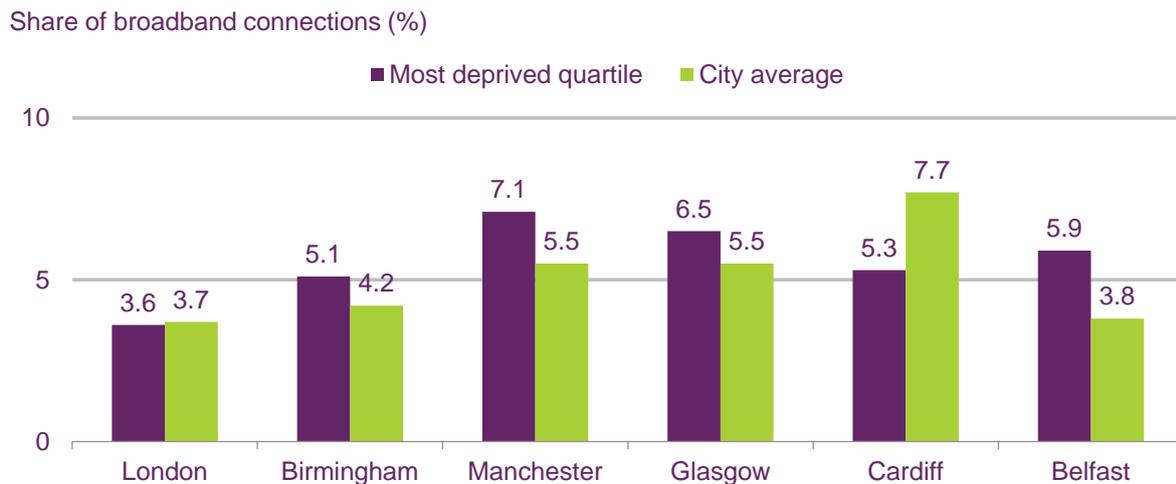
- **Across most cities studied, there were a higher proportion of connections with speeds of less than 2Mbit/s in the most income deprived quartile than the city average.** The exception was Cardiff where the proportion of '<2Mbit/s' connections in the most income deprived quartile was lower than the average for Cardiff, while in London the proportion of '2Mbit/s' connections in the most income deprived quartile was similar to the city average. Similarly, all cities except Cardiff had lower NGA availability in their most income deprived quartiles than the average for each city.
- **In Glasgow, the areas of greatest deprivation were those where NGA broadband was least available.** Similarly, the most income deprived areas in Glasgow had the highest proportion of '<2Mbit/s' connections although the lack of a consistent trend across the quartiles suggests that other factors may have an overriding effect.
- **In Cardiff, NGA availability was lowest in the least deprived areas of the city.** These areas also had the greatest share of broadband connections with speeds of less than 2Mbit/s while the most income deprived area of the city had the smallest share. One explanation for this could be that the northern and western areas of Cardiff, which have very low levels of deprivation, are more rural and suburban while still falling within the city boundaries.
- **NGA availability was exceptionally high across Belfast although it was slightly lower in the most income deprived areas.** Despite high NGA availability, there was still a notable proportion of '<2Mbit/s' connections in the most income deprived areas, which suggests that many consumers in these areas are choosing not to upgrade to an NGA service.

4.4 NGA availability and proportion of connections with speeds of less than 2Mbit/s in the most income deprived areas of cities

In the majority of cities, there were a higher proportion of connections with speeds of less than 2Mbit/s in the most income deprived quartile than the city average

In all cities except Cardiff and London the most income deprived quartile of premises had a higher share of broadband connections with speeds of less than 2Mbit/s than the average for the city. For example, the average number of '<2Mbit/s' connections in Manchester was 5.5% but in the most income deprived quartile this rose to 7.1% of connections. In London, there was little difference between the most income deprived quartile and the average number of '<2Mbit/s' in the city as a whole while in Cardiff the proportion of '<2Mbit/s' connections was actually lower than the city average.

Figure 1.6 Proportion of '<2Mbit/s' connections by city average and most income deprived quartile

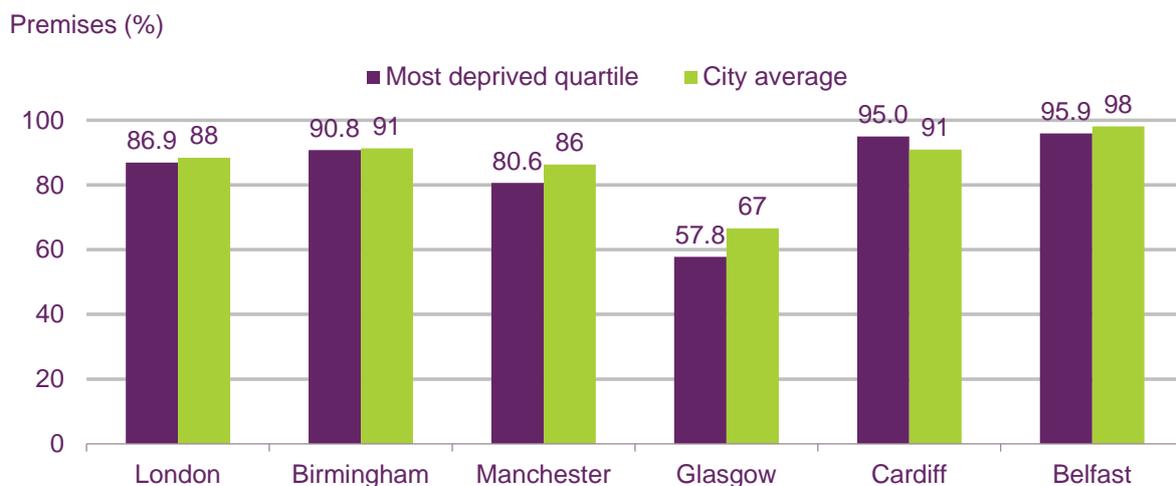


Source: Analysys Mason, IMD, Ofcom June 2013

Notes: Equal premises count method

There was a much smaller difference in NGA availability when the most income deprived quartile was compared to the city average although both Manchester and Glasgow had notably lower NGA availability in their most income deprived quartiles than the city average.

Figure 1.7 NGA availability by city average and most income deprived quartile



Source: Analysys Mason, IMD, Ofcom June 2013

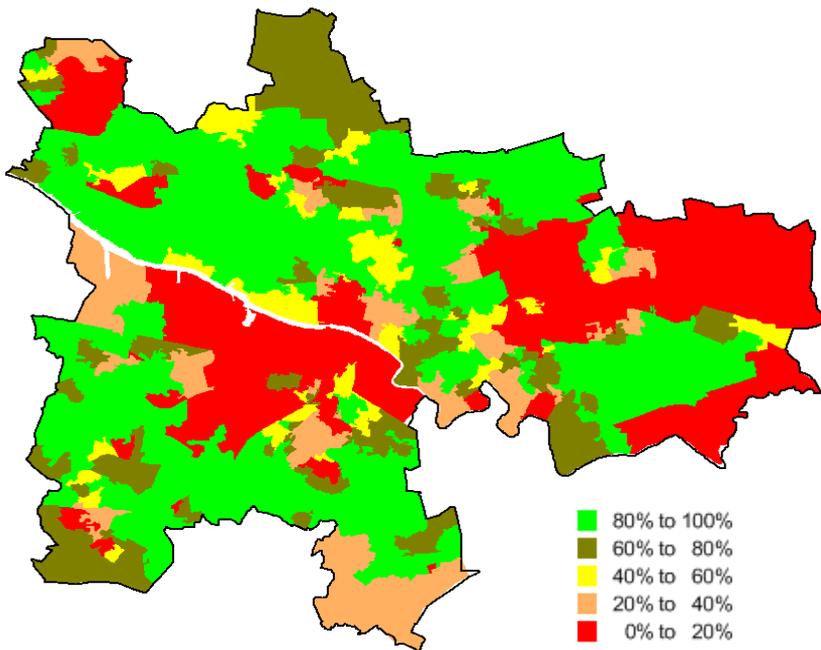
Notes: Equal premises count method

4.5 Case study: Glasgow

In Glasgow, the areas of greatest deprivation were those where NGA broadband was least available

Low levels of NGA broadband availability, shown using red in Figure 1.8, are scattered throughout Glasgow, but the north and south-west regions are generally well-served with NGA broadband.

Figure 1.8 NGA broadband availability in Glasgow

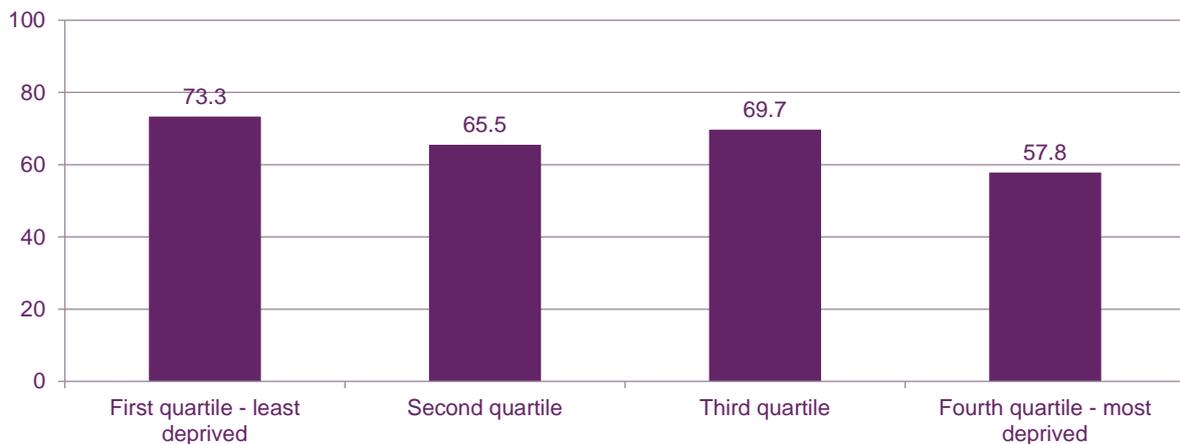


Source: Analysys Mason, Ofcom Infrastructure Report 2013

The greatest difference between the availability of NGA in the most and least income deprived areas was 15.5 percentage points in Glasgow, while it was at most 6.2 percentage points among the remaining cities. This is likely a reflection of the limited roll-out of NGA across Glasgow at the time of measurement.

Lower NGA availability in income deprived areas could be explained by the weaker incentive for telecoms companies to invest in areas where average revenue per user is likely to be lower. Alternatively, since roll-out was not yet complete, this correlation might be explained by telecoms companies having a preference for upgrading infrastructure in less income deprived areas first, where take-up is likely to be initially higher.

Figure 1.9 NGA availability in Glasgow, by income deprivation

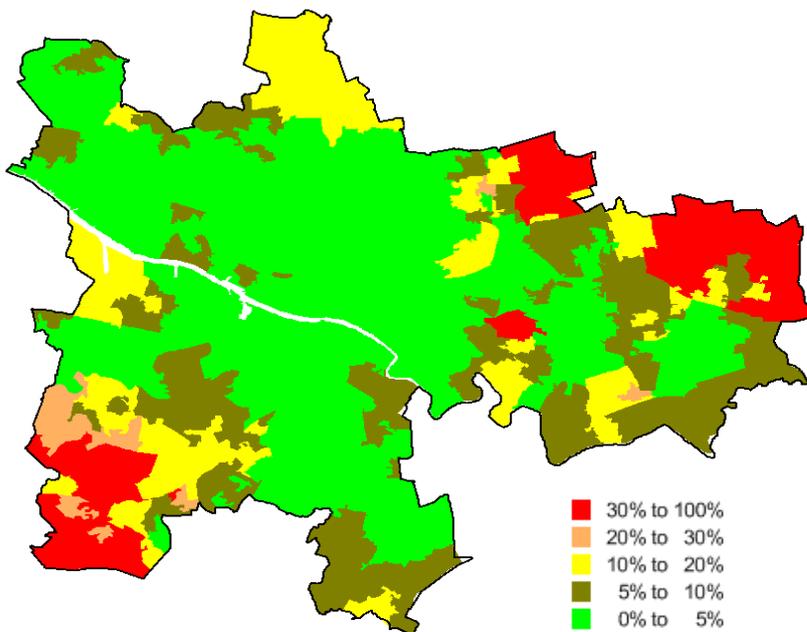


Source: Analysys Mason, IMD, Ofcom June 2013
Notes: Equal premises count method

In Glasgow, the most income deprived areas had the highest proportion of '<2Mbit/s' connections

Areas with the highest percentage of '<2Mbit/s' connections, shown using red in Figure 1.10, are mostly in the north-east and south-west of the city; most of the city has a low percentage of '<2Mbit/s' connections (between 0% and 5%).

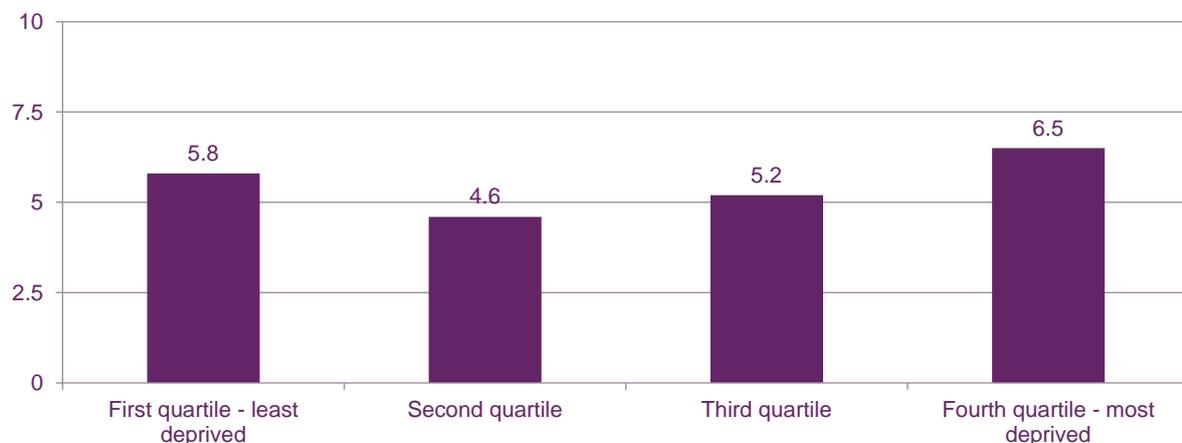
Figure 1.10 '<2Mbit/s' connections in Glasgow



Source: Analysys Mason, Ofcom Infrastructure Report 2013

Although the highest proportion of '<2Mbit/s' connections fall in the most income deprived areas of Glasgow, there is not a consistent trend across the quartiles, which may be explained by the fact that other factors (such as existing take-up and premises density) have an overriding effect in some areas.

Figure 1.11 Broadband connections with speeds of less than 2Mbit/s in Glasgow, by income deprivation



Source: Analysys Mason, IMD, Ofcom June 2013

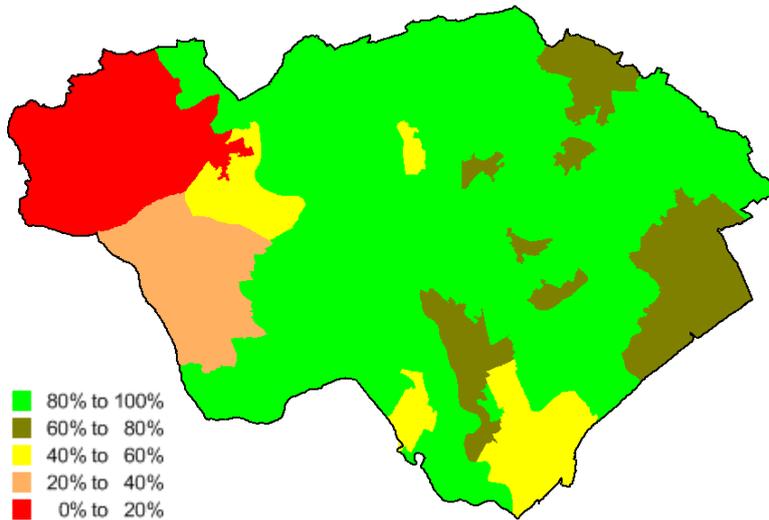
Notes: Equal premises count method

4.6 Case study: Cardiff

In Cardiff, NGA availability was lowest in the least deprived areas of the city

Areas with low availability of NGA broadband, shown using red in Figure 1.12, are concentrated in the west of Cardiff; the rest of the city is well served with NGA broadband.

Figure 1.12 NGA broadband availability in Cardiff

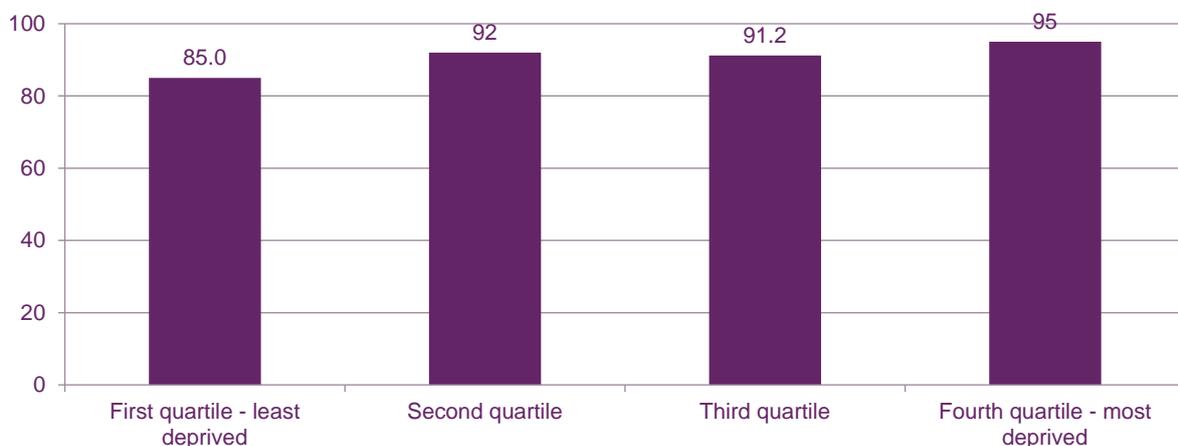


Source: Analysys Mason, Ofcom Infrastructure Report 2013

The difference between the availability of NGA in the most and least income deprived areas was 10 percentage points. This is surprising as we would normally expect NGA availability to be lowest in the most deprived areas, which is the case in the majority of the other cities that we studied.

One explanation for this could be that the northern and western areas of Cardiff, which have very low levels of deprivation, are more rural and suburban while still falling within the city boundaries. As such, it is likely to be more expensive for operators to roll-out NGA infrastructure to these areas. However, we understand that the Welsh Government's Superfast Cymru rural broadband project will address the NGA broadband availability issues faced by the western parts of Cardiff.

Figure 1.13 NGA availability in Cardiff, by income deprivation

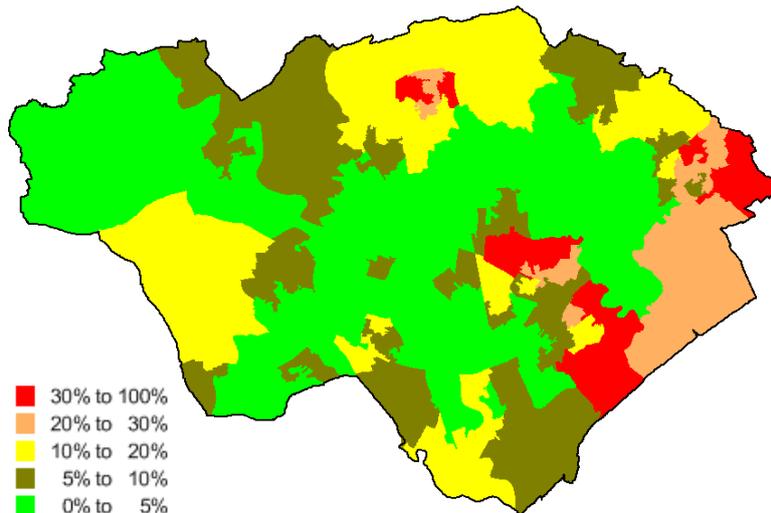


Source: Analysys Mason, IMD, Ofcom June 2013
Notes: Equal premises count method

Rural factors may also have influenced the proportion of '<2Mbit/s' connections in Cardiff

Areas with the highest percentage of '<2Mbit/s' connections, shown using red in Figure 1.14, are mostly in the east of Cardiff, although areas in the north and west of the city also have notable numbers of '<2Mbit/s' connections.

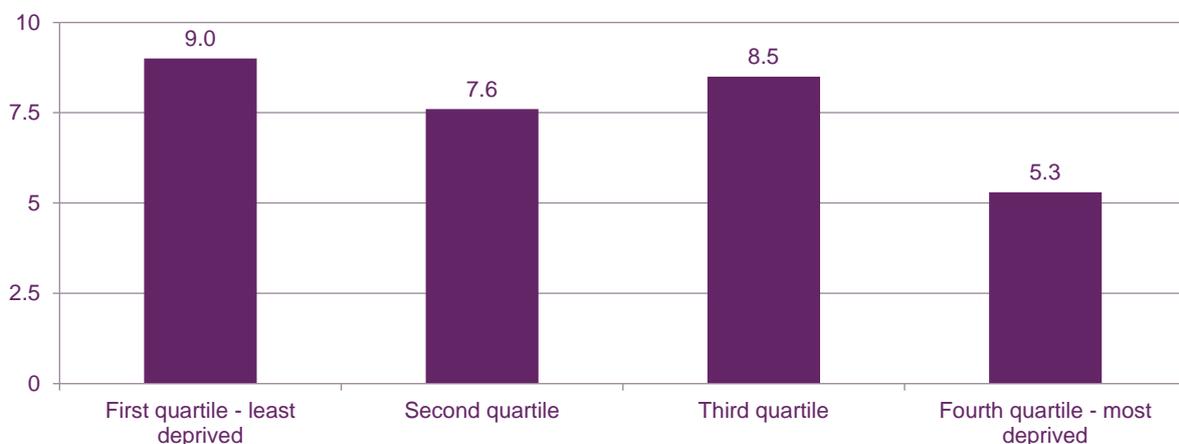
Figure 1.14 '<2Mbit/s' connections in Cardiff



Source: Analysys Mason, Ofcom Infrastructure Report 2013

The least income deprived quartile of the city had the greatest share of broadband connections with speeds of less than 2Mbit/s while the most income deprived area of the city had the smallest share. As discussed above, this may be explained by the more rural nature of the western and northern parts of the city. This means that the distance between premises and the local exchange are likely to be longer which increases the likelihood of slower speeds.

Figure 1.15 Broadband connections with speeds of less than 2Mbit/s in Cardiff, by income deprivation



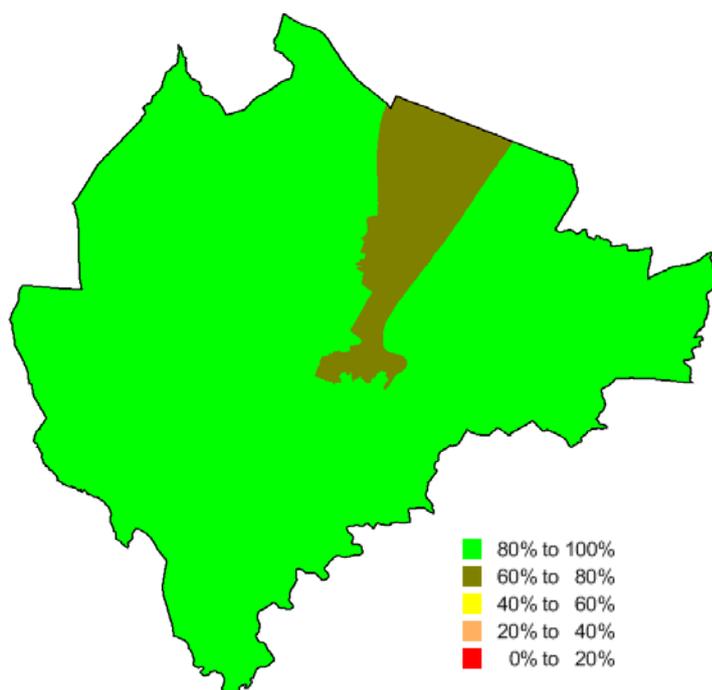
Source: *Analysys Mason, IMD, Ofcom June 2013*
Notes: *Equal premises count method*

4.7 Case study: Belfast

NGA availability was exceptionally high across Belfast although it was slightly lower in the most income deprived areas

Belfast is generally well served by NGA broadband. This most likely reflects the broadband intervention project initiated by the Department of Enterprise, Trade and Investment in 2009 to upgrade around 1300 cabinets in approximately 170 exchange areas across Northern Ireland (including some located in Belfast).

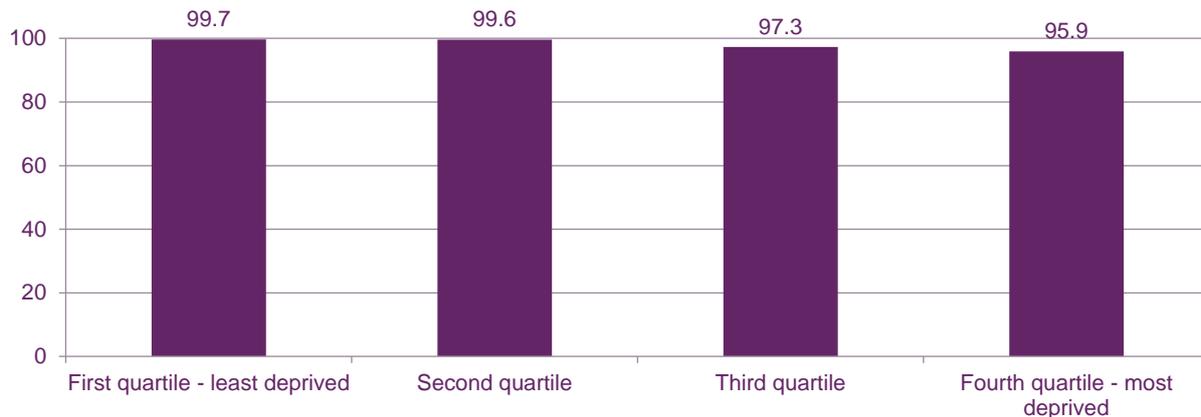
Figure 1.16 NGA availability in Belfast



Source: *Analysys Mason, Ofcom Infrastructure Report 2013*

Despite this, NGA availability is lower in the most income deprived areas, which may be because operators have chosen to rollout NGA services to higher income areas first. However, even in the most deprived areas of Belfast, NGA availability is higher than in many of the other cities assessed.

Figure 1.17 NGA availability in Belfast, by income deprivation



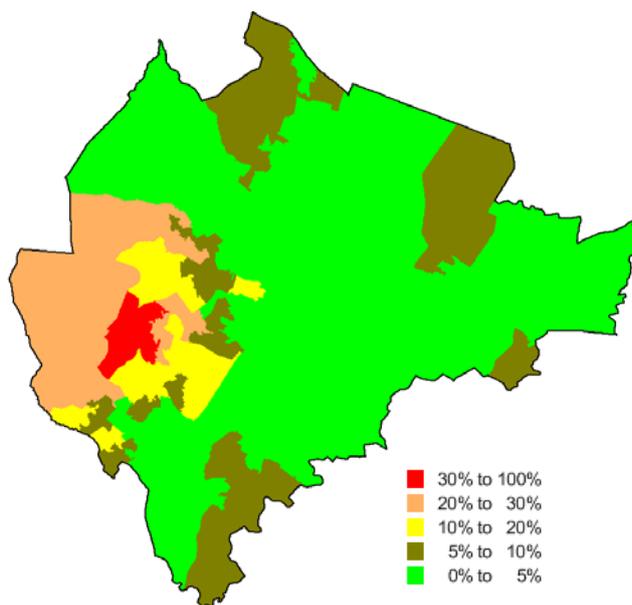
Source: Analysys Mason, IMD, Ofcom June 2013

Notes: Equal premises count method

Despite high NGA availability, there was still a notable proportion of '<2Mbit/s' connections in the most income deprived areas

Areas with the highest percentage of '<2Mbit/s' connections, shown using red in Figure 1.18, are in the west of the city; there is a relatively low proportion of '<2Mbit/s' connections in the remaining parts of the city.

Figure 1.18 '<2Mbit/s' connections in Belfast



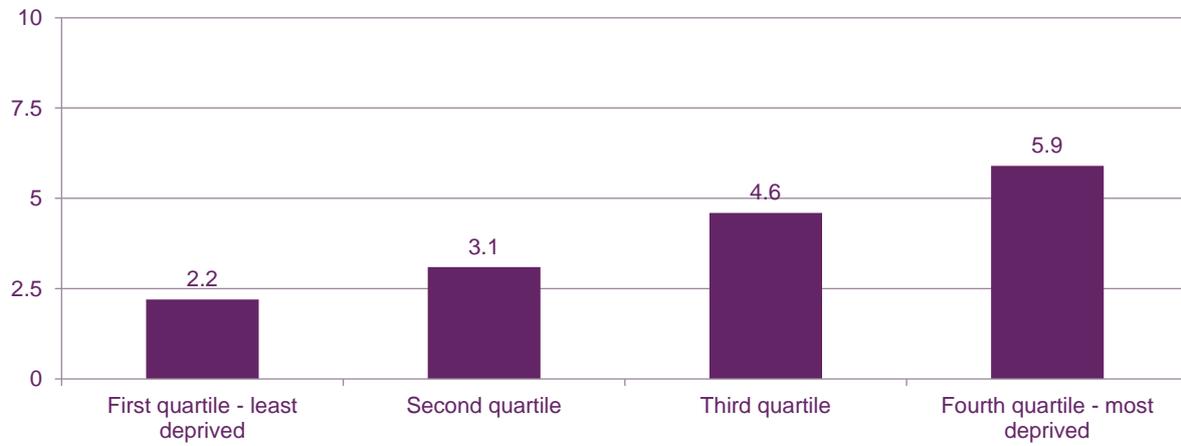
Source: Analysys Mason, Ofcom Infrastructure Report 2013

There were a significantly greater proportion of broadband connections with speeds of less than 2Mbit/s in the most income deprived quartile than the least deprived quartile in Belfast, a 3.7 percentage difference.

This suggests that, despite widespread availability of NGA services, some consumers experiencing speeds of less than 2Mbit/s are choosing not to upgrade their connection to receive a faster speed. One explanation for this might be that consumers in income deprived

areas are less able to afford to upgrade to an NGA service. Alternatively, some consumers may be happy with the service they are receiving and therefore see no reason to upgrade.

Figure 1.19 Broadband connections with speeds of less than 2Mbit/s in Belfast, by income deprivation



Source: Analysys Mason, IMD, Ofcom June 2013

Notes: Equal premises count method

Section 5

Emerging conclusions

We consider that two main conclusions may be drawn from our analysis so far:

- Cities have a smaller proportion of broadband connections with speeds of less than 2Mbit/s than the UK as a whole. However, the distribution of <2Mbit/s connections does not appear to be even in most cities. Instead, areas of greater income deprivation tend to have a higher proportion of <2Mbit/s lines than the rest of the city. Also, while most <2Mbit/s connections were in areas where an NGA service was available, the majority chose not to upgrade. This could be for a variety of reasons including that they are satisfied with the service they are currently receiving, that they cannot afford to upgrade to an NGA service, or that they are not aware of the benefits of upgrading to an NGA service.
- Cities have greater availability of NGA broadband services than the UK as a whole. However, NGA availability is not evenly distributed across most cities. Instead, areas of greatest income deprivation in a city were least likely to have NGA services available although this difference may disappear over time as operators continue to rollout NGA services.

The issues affecting broadband availability in rural areas are well-known. However, slow broadband and limited NGA availability also affects a significant minority of consumers in cities. Our analysis suggests that the factors driving this are often complex and highly localised.

In some cities, there appears to be a relationship between socio-economic factors and availability. In others, most notably Cardiff, geographical challenges appear to have more of an impact. Equally, a range of other factors may affect broadband availability too. These include:

- Operators may be taking a commercial decision to roll out NGA services in areas where it is cheapest. For example, it might be expensive to deploy infrastructure in areas of cities that are more rural, have low population density, or have a high number of business premises.
- Operators may be taking a commercial decision to maximise their revenue by rolling out NGA services in higher income areas first.
- Operators may be taking a commercial decision on where to rollout their services based on the location of other providers' NGA networks.
- Operators may be reluctant, for commercial reasons, to deploy NGA networks in areas where there is low take-up of first-generation broadband services.
- Legacy infrastructure constraints may make NGA rollout difficult in certain areas of cities. For example, some areas may have exchange only lines that are connected directly to the local exchange and do not have a cabinet to allow FTTC to be deployed.
- It may be difficult to obtain the rights to install NGA equipment in the types of housing more likely to be found in cities such as multiple dwelling units.

- Some consumers currently experiencing speeds of less than 2Mbit/s may be unable to afford to upgrade to an NGA service.
- Some consumers may not be aware that switching to an NGA service would solve slow connection speed problems.

We also note that broadband availability is continually evolving and our analysis has shown an increase in NGA availability and a decrease in the number of <2Mbit/s connections since 2012, a trend which we would expect to continue in the next few years.

Overall, our analysis demonstrates the importance of assessing broadband availability issues in cities on a case by case basis and at a micro level.

Section 6

Next steps

We plan to supplement our existing work with analysis on take-up of broadband services in cities, which we will publish alongside our availability findings in the 2014 CMR and Nations CMR.

In September, Ofcom will be publishing the next edition of the Infrastructure Report.⁹ This annual assessment of the state of the UK's communications infrastructure will consider what, if any, policy implications may be emerging from our analysis of communications services in densely populated areas.

** The 2013 Infrastructure Report is available from our website:

<http://stakeholders.ofcom.org.uk/market-data-research/other/telecoms-research/broadband-speeds/infrastructure-report-2013/>

Annex 1

Communications infrastructure and services in international cities

1.1 Introduction

Following our investigation into communications services in UK cities, we commissioned further research to examine the availability of communications services in six international cities across four continents. This research provides an assessment of the extent to which people living in these cities benefit from communications technologies, infrastructure and services, and what non-commercial factors, if any, are driving these differences.

The relevant cities are listed below, and were chosen to represent a range of urban populations across the world.

- Chicago, USA
- Hamburg, Germany
- Lagos, Nigeria
- Milan, Italy
- Seoul, South Korea
- Warsaw, Poland

The full report can be found on Ofcom's website.¹⁰

1.2 Summary of key findings

- **First generation broadband services providing speeds of over 2Mbit/s are widely available in all cities with the exception of Lagos.** Development of both the fixed telephony and fixed broadband markets in Nigeria has been hampered by poor management of telecoms infrastructure, unreliable power supply and low PC penetration.
- **Next-generation access (NGA) broadband services capable of providing over 30Mbit/s download speeds are increasingly becoming available.** With the exception of Lagos, more than half of the population of every city are able to access an NGA service.

¹⁰ <http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr13/icmr/cities-infrastructure-cmr13.pdf>

Figure 1.20 First-generation and NGA broadband coverage in five of the six cities

City	First-generation broadband coverage	Current NGA broadband coverage
Chicago	99%	98%
Hamburg	100%	95%
Milan	100%	55% (as at end 2011)
Seoul	100%	Over 90%
Warsaw	100%	>95%

Source: Analysys Mason 2013

The other key findings of the report are set out below.

- Copper network DSL infrastructure remains the dominant architecture for fixed broadband networks.
- The majority of the operators (especially the incumbents) in most of the cities have maintained their market share utilising DSL infrastructure and also have plans to upgrade their networks to VDSL-based fibre-to-the-cabinet (FTTC) infrastructure.
- Availability of NGA fibre-to-the-home (FTTH) infrastructure is also increasing with operators in Hamburg, Milan, Seoul and Warsaw extending their FTTH network.
- Cable infrastructure plays an important role in the availability of high-speed broadband infrastructure, although Lagos and Milan are exceptions as they have no cable network deployments.
- All the cities have launched, or plan to launch public sector based Wi-Fi initiatives to provide either free or subsidised Wi-Fi access to residents and/or visitors.
- 4G services are available from at least two mobile network operators in all six international cities.
- Public policy and intervention initiatives have influenced, or continue to influence, availability of infrastructure and encouragement of take-up of communications services in all cities. For example, the Gigabit Squared Chicago initiative aims to deploy NGA in nine demonstration neighbourhoods, connected together with the excess fibre capacity that will be leased from the City's own fibre network. In Seoul, residents will have benefitted from the government certification scheme, set up in 1999, for buildings with over 20 households and 3,300sqm, providing potential householders with a clear indication of the standard of the in-building cabling, and the likely broadband speeds that it can support.

1.3 Comparisons with UK cities

The small number of cities analysed, and the fact that they are at varying stages of development, makes it difficult to draw firm comparisons between them, or with the cities that we have studied in the UK. Nonetheless, it is possible to make a few general comments.

Broadband infrastructure in the international cities assessed appears to be developing at a similar rate to UK cities. First-generation broadband services providing speeds of greater than 2Mbit/s are widely available in all the international cities, with the exception of Lagos,

and NGA broadband services are becoming increasingly widespread. The majority of the operators in most of the cities have plans to upgrade their networks to VDSL-based FTTC infrastructure, which is the approach BT is taking in the UK, although notably availability of FTTH infrastructure is also increasing. Similarly, as in the UK, cable infrastructure plays an important role in the availability of high-speed broadband infrastructure in many of the cities.

The impact of public policy and intervention initiatives on the availability and take-up of communications services in all the international cities is also notable, especially as many similar initiatives are taking place, or being planned, in the UK. For example, in Chicago, there have been initiatives to provide ubiquitous wireless broadband networks to close the digital divide. Similarly, the Lagos State Government has indicated its ambition to deploy a city-wide Wi-Fi solution, which could have an impact in accelerating the process of solving urban and social challenges and delivering high-impact solutions to improve the lives of residents in the city.

Overall, it appears that all the cities are recognising the importance of widespread availability of communications services, even if the solutions required to achieve this are likely to be unique to each city.