

**Coast to
Capital**



**Digital
Connectivity
Research 2019**

The Fifth Sector

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Executive summary

Improving digital network capability is one of eight priorities in Gatwick 360°, The Coast to Capital Strategic Economic Plan 2018-2030. It is also – correctly – identified as an enabling technology to all the others.

Digital network connectivity plays a significant role in addressing the growth and productivity challenges faced by the Coast to Capital economy:

- Although Coast to Capital is part of the third most innovative region in Europe after Stockholm and Copenhagen¹, its levels of growth productivity, measured by Gross Value Added (GVA) per head, have declined since 1999 relative to the UK average².
- Coast to Capital's economy is extremely diverse, with no dominant industrial sectors. Future economic strengths lie in a range of economic sub-sectors as set out in the Gatwick 360° strategy³.
- The businesses within these priority sectors are geographically dispersed; unlike many comparator LEP areas, Coast to Capital has no single large metropolitan centre to act as a driver of specialisation and productivity and a magnet for investment.
- Coast to Capital is relatively more rural than many of its competitors, with a wide disparity in the scale and density of settlements found between inner urban core, suburban, semi-rural and rural and coastal areas.
- Whilst connectivity to London is good, providing a second major gateway to international markets to complement the one provided by Gatwick, the higher wages on offer in the capital present a challenge in retaining skilled residents within the workforce of Coast to Capital.
- The relatively poor level of physical connectivity between towns in Coast to Capital and with economic hubs within the South East region and across the UK (other than London) adds cost, reduces productivity, hinders knowledge exchange and limits market opportunities.

Figure 1. Priorities of Gatwick 360° Strategic Economic plan



- Deliver prosperous urban centres
- Develop business infrastructure and support
- Invest in sustainable growth
- Create skills for the future
- Pioneer innovation in core strengths
- Promote better transport and mobility
- Improve digital network capability
- Build a strong national and international profile

Both the dispersal and different density of settlements across the region lead to great disparities in the levels of digital network connectivity from place to place. The relatively high proportion of lower density settlements (both rural and coastal) that are more distant from existing digital

¹ Source: European Commission, Regional Innovation Scoreboard (RIS), 2017

² Source: University of Sussex, A comparison of Coast to Capital with comparator Local Enterprise Partnerships, 2018

³ MedTech; Pharmaceuticals; Computer Software Programming and Publishing; Data Processing & Hosting; Insurance and Financial Services; Telecommunications; Visitor Economy and Support Services; Air Transport; Horticulture and Food Manufacturing; Computer & Consumer Electronic Manufacturing; Communications and Navigation Equipment Manufacturing; Electric Power Generation and Transmission; Automotive Manufacturing

communications networks makes it more difficult, and more expensive, to provide full fibre connectivity to businesses and residents in those areas.

Those challenges of **density, dispersal, distance and diversity** make it less likely that any single approach to developing digital connectivity across the region can succeed. Due to this diversity, individual local authorities have had to take different views of the most appropriate ways to secure investment in new digital network infrastructure in their respective areas. At present, the region has various initiatives at different stages of maturity, with some being more advanced than others; but it is evident that there is a good level of collaboration between the various local authorities.

Opportunities

There is a strong economic, social and environmental case for action by public sector stakeholders to use their assets and their leverage in the market to create and assemble new digital infrastructure. Consultation with the region's local authorities and universities revealed that they are aware of and excited by these possibilities. They see the potential in a joint approach to digital infrastructure development, starting with a regional framework of digital 'spine' networks, to transform both the supply of digital network capability and the ways in which it is used by the public sector, businesses and communities.

If successful, this could turn what currently perceived as a problem in industrial strategy terms – the combined challenges of density, dispersal, distance and diversity – into a significant asset, and one that distinguishes Coast to Capital and its economy from competitors.

Levelling the playing field for investment in new network Infrastructure

Digital 'spine' networks bring high capacity fixed line fibre optic telecommunications infrastructure into more remote and less dense areas for which there is currently no investment case (or a marginal case which means that their commercial deployment is likely to lag behind that in more dense areas or ones closer to existing network hubs.) Once they are installed, it moves more rural and coastal areas onto an equal commercial investment footing with more urban areas. For example, the cost of a telecommunications mast is uniform in rural and urban environments; the total cost of installation depends on its proximity to fibre 'backhaul'. If backhaul already exists in more remote areas, Internet Service Providers (ISPs) and Mobile Network Operators (MNOs) can invest in fixed line and mobile access networks at a cost that can be less than that in more built up environments, where additional costs of street works and planning constraints may make it more expensive to lay new duct. Easy access to digital development and exchange facilities in a variety of semi-rural and rural locations, could help smaller, local ISPs and MNOs to work with rural sectors to gain first mover advantage in a global market for a set of services and standards for agriculture and land-based technologies, providing farmers with access to digital innovation and IoT (internet of things) technology to help them diversify income and increase productivity – eg, from higher value specialisms, such as vineyards.

Mixed economy model

Developments such as the West Sussex Business Rates Retention pilot demonstrate that local authorities and public sector partners across Coast to Capital already understand the need for a strategic framework within which multiple projects, deployed at different times, at different levels of network infrastructure and using different commercial models, can be combined to transform digital network capability across the LEP area. The report further develops the case for action by public sector stakeholders to use their assets and their leverage in the market to create and assemble a

new infrastructure, setting out a *theory of change* that links the direct and indirect outputs of investment with the achievement of other outcomes prioritised in Gatwick 360°.

Coast to Capital LEP can take the lead in stimulating improvements in digital network capability by creating a framework for collaboration, able to marshal the efforts of both public and private sector. This requires that the LEP set out a 'mixed economy' model that can help coordinate existing and planned investments by partners in both public and private sectors by encouraging the combined use of innovative **methods** to bring forward network deployment and provide **criteria** for smaller, local ISPs and MNOs to inform shared structures for governance and planning of new networks:

- **Methods** to reduce barriers to and increase investment in digital infrastructure, through which investments in digital infrastructure can, over time, be brought together to form a single, open access digital connectivity infrastructure that optimises the outcomes of both public and private sector investment to ensure economic benefit and greater social equity for all of Coast to Capital's communities.
- **Criteria** for collaboration that local authorities and stakeholders (including central government) can apply to different opportunities and challenges to ensure that all new investment contributes to the growth of this strategic and collaborative framework and retains its potential for further development and innovation.

Governance

Coast to Capital LEP can take a leading role in implementing the 'mixed economy' model by putting in place the governance needed to derive maximum benefit from coordinated, strategic activity to increase the amount and penetration of digital infrastructure in the region and surrounding areas.

One way in which Coast to Capital can achieve this is to lead on the establishment of a **digital infrastructure stewardship body**, which would perform two functions:

- Coordination of the actions by Coast to Capital stakeholders in the creation of a shared infrastructure.
- Stewardship and management of assets created by dig-once opportunities.

The digital stewardship function embraces the contribution of private sector investors – communications providers, ISPs, developers, demand from business and residential users, and others – as well as the activity of external partners, such as national agencies. It provides the LEP with a mechanism through which it can actively seek out and engage with those organisations in a constructive way to ensure that any intervention in digital network capability is successful and that it aligns with the Local Industrial Strategy (LIS).

The benefits of that engagement – in direct and secondary outputs and wider network effects on sustainable growth, productivity and resilient communities – can in turn be measured against the LIS. The LEP's role in digital infrastructure stewardship is important in ensuring that priorities within the LIS are supported by both commercial and public sector investment plans.

Recommendations

The report concludes with five recommendations which combine to transform digital infrastructure provision across the Coast to Capital region. These interventions all draw on the evidence of need expressed by stakeholders consulted during the research.

Four of the recommendations represent innovative methods for accelerating the deployment of digital telecommunications infrastructure, some of which have already been piloted by local authority partners in the LEP area:

1. Prioritise investment in an open access fibre digital ‘spine’ (or ‘scaffold’)

A shared open-access regional spine (‘scaffold’) fibre network, spanning the LEP region utilising diverse suppliers, connected by several DX and ‘DX-PoP’ access points across the LEP region would help to overcome barriers. The principle of a regional spine fibre network needs to be tested with the market to understand how it could be commercialised; but if accepted, it would support the business case for investment in new ‘access’ networks and local spine networks.

Local authorities and other public bodies are already investing their own and central government funds in partnership with the commercial sector to extend digital infrastructure into towns, rural and coastal areas across the region. Coast to Capital can accelerate this process by providing a framework for collaboration and growth that articulates the benefits of a ‘mixed economy’, in which models that reflect differing levels of local supply and demand can be mediated through application of a set of methods proven to be effective in helping to accrete network infrastructure and attract investment in new digital network.

2. Coast to Capital should lead on the establishment of a dig once stewardship body

The spine can be assembled by aggregating assets based on a range of investment cases in a ‘mixed economy’ model; from dig-once duct, through collaboration with private investors in trench and duct sharing, by capitalising public sector revenue costs over a period to save costs through owned infrastructure.

We recommend that Coast to Capital works with local authority partners to establish a stewardship body to administer ‘dig once’ policies for the creation and accretion of new duct for fibre across the region. Dig once stewardship mechanisms have been used successfully in the US, and now in some UK cities, to deploy fibre-duct infrastructure at minimal cost. They do this by addressing opportunities to install ducting for fibre at very low cost when digging is already taking place; for example, when developers construct new housing or business developments, or when local authorities build new roads, upgrade, or create bus corridors. Duct could also be installed when utilities companies dig up the roads to upgrade or deploy other infrastructure.

The dig once stewardship body would be set up to take ownership of the growing duct network created through a regional dig-once policy and other public sector interventions. But it could, depending on its governance structure and agreement of partners, have a wider advisory and operational role to lead the infrastructure strategy and coordinate the efforts of multiple stakeholders. By establishing a shared framework to oversee the accretion and exploitation of these assets the LEP can help reduce costs and barriers to deployment of the digital spine.

3. Create (or engage) a cooperative neutral host to manage and commercially exploit network infrastructure

The cooperative neutral host (or ‘thin layer’) model offers many benefits as the means to provide open access to shared duct assets. Cooperative neutral hosts can be used to allow public bodies to invest in new digital connectivity network without distorting competition. The thin layer model allows multiple owners of the ‘passive’ layer of telecommunications infrastructure (duct and fibre) whilst promoting competition amongst wholesale suppliers and internet service providers for its use. This model, as developed by Tameside Metropolitan Borough Council over the last five years, and successfully commercialised through Cooperative Network Infrastructure, has proven successful in attracting engagement and investment from private sector operators.

We recommend that Coast to Capital and its partners pursue initial market engagement on the potential to develop the cooperative neutral host model as a necessary input to the choice of model to ensure maximum commercialisation opportunities and benefit from opening access to an expanded network of shared duct assets that would result from development of a regional spine infrastructure, commercial investment and application of a dig once stewardship model.

A cooperative neutral host is mostly a contracting body. It charges operators access fees in return for giving them access to ducts into which they can lay fibre; and pays asset owners rent. It also makes arrangements for fibre maintenance. The cooperative neutral host would mediate access to contributed assets, including but not limited to those owned by Coast to Capital partners including the LEP, local authorities, universities and other public sector bodies. It would take the form of a cooperative society to ensure neutrality, following the precedent of successful commercial models for shared asset use such as LINX (the London Internet Exchange, which mediates transit of the overwhelming majority of the digital network connectivity that enables UK internet services.)

4. Create a mechanism to support aggregated user investment by businesses and residents.

Coordinating demand for improved digital network capability, as well as supply, is a powerful way to attract investors in new digital infrastructure. UK government has recognised this, in the form of the Gigabit Connectivity Voucher Scheme; but its funding is limited. In the longer term, a mechanism to facilitate the aggregation of end user funds (crowd funding) could finance new duct and fibre build across the Coast to Capital region. This could be through creation of a new body such as a Community Benefit Society, able to issue shares accredited through the community shares scheme, or by working in partnership with an existing body such as B4RN or Cooperative Network Infrastructure.

5. Create a distributed regional ‘sandbox’ for application of digital technology

The final recommendation is **to create a distributed regional ‘sandbox’** for application of digital technology innovations across all sectors of the economy. A ‘sandbox’ is a physical or virtual environment, typically operated by a university or research institution, in which companies and researchers can collaborate in consumer-focused testing and development of new products and services. Developing these facilities, establishing them as a network of new nodes of digital connectivity and using them to provide points of access to digital skills interventions, would be a distinctive way to address the dispersed nature of key industrial sectors across the Coast to Capital area, whilst drawing on the diverse research strengths of the region’s universities and the existing success of Brighton in attracting national funding for innovation in digital technologies.

Outcomes

Coast to Capital has the capacity and vision to translate these elements – a framework for ‘mixed economy’ growth; proven methods to accelerate deployment of new digital connectivity networks; and a mechanism that builds on the strengths of the regional knowledge base to improve the translation of research and innovation activity into commercial applications across all sectors of its economy – into a distinctive strand of Local Industrial Strategy.

By leading on the development of a shared strategic framework for digital infrastructure development that promotes innovation and collaboration to address barriers to investment, and prioritises investment in shared open access digital ‘spine’ networks, Coast to Capital can help public sector authorities to plan and deploy interventions that deliver higher levels of return on

investment by local authorities and public sector partners, to be reinvested in digital infrastructure or to provide revenue to support other core activities.

- The leverage that a shared strategic framework and governance arrangements can exert on commercial investment plans will allow public funds to be deployed in the most economic, effective and efficient way.
- Increased investment in digital network capability will have additional secondary and tertiary benefits for the region.

The result is to deliver a network that is more than the sum of its parts, and addresses the major priorities of Local Industrial Strategy by ensuring that:

- Commercial investment in digital infrastructure is increased.
- Public funding is used effectively to optimise leverage of further commercial investment, and to persuade commercial operators to prioritise development of fixed line and mobile networks within the Coast to Capital region.
- Local authorities and public bodies are clear about the opportunities to invest in infrastructure for their own direct financial return as well as to obtain strategic and regeneration benefits of secondary and tertiary benefits of increased digital network connectivity.
- Digital infrastructure investment is harnessed to delivery of local industrial strategy priorities for sectoral and productivity growth and the development and regeneration of socially just and resilient places.

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1. Background

This research builds on the commitment in Gatwick 360° to improve digital network capability in Coast to Capital, by exploring in further detail the existing digital infrastructure projects in the area and how the LEP and its partners might leverage and enhance those assets. It will help to develop a coherent and ambitious vision for the area and how we might best translate investment in this infrastructure into social and economic value.

More specifically, the research aims to:

1. Develop an understanding of the existing projects around digital infrastructure being undertaken in the Coast to Capital and neighbouring areas, identify gaps and look at how the LEP and its partners might leverage and enhance those assets, either individually or by combining, to generate additional value.
2. Develop a coherent, compelling and ambitious vision that integrates the discreet schemes and approaches happening and being planned into a coherent narrative, one that aligns with the Government's Industrial Strategy and with Gatwick 360° and can inform the Coast to Capital Local Industrial Strategy (LIS).
3. Focus on and draw out the economic impact on the Coast to Capital area that this proposed approach will deliver and make recommendations about the methods and governance that are needed to turn infrastructure into value, building on and widening out existing activity.

The research covers the full Coast to Capital geography, but pays particular attention to four place-based growth opportunities as set out in Gatwick 360°⁴:

- The Brighton-Gatwick-London corridor.
- The towns around Gatwick airport.
- The coastal towns with Brighton as a key driver.
- The rural area.

1.1 Our advantage

Coast to Capital already offers itself as a case study for innovation in transformational digital infrastructure. Brighton is the home of a Digital Catapult Centre, the UK's first digital exchange and the first 5G testbed established in a non-academic setting. The region's three Universities offer a strong mix of research and teaching in disciplines which complement the strengths in sectors across the Coast to Capital area.

1.2 Our ambition

Digital connectivity is an enabler of many of the other priorities in the LIS:

- Provision for Gigabit-capable fibre to the home connections (FTTH) should form part of plans for all new house building. This is a significant priority: Homes England has identified Coast to Capital as a target area for the development of new affordable housing.

⁴ Gatwick 360°: The Coast to Capital Strategic Economic Plan 2018-2030
https://www.coast2capital.org.uk/storage/downloads/coast_to_capital_strategic_economic_plan_2018-2030_pdf-1535099447.pdf

- Affordable full fibre services, including access to dark fibre, are integral to the development of commercial space, and is key to the development of new business parks in the strategic priority area around Gatwick.
- Full fibre connectivity is a critical success factor in plans to improve levels of innovation across all sectors of the economy.

1.3 Our challenge

Coast to Capital's economy is distinguished by high levels of productivity across several key sectors. But over the last two decades, the area has struggled with growth in employment and productivity below the UK average.

Coast to Capital's economic geography is atypical among Local Enterprise Partnerships, many of which are driven by a single large metro area. Instead, it has a diverse range of urban, rural and coastal settlements, including those within National Parks and Areas of Outstanding Natural Beauty, which vary widely in their density and distance from digital connectivity networks.

Coast to Capital LIS needs to reconcile demands for growth and productivity connectivity with the needs of rural, semi-rural and coastal businesses and communities, for whom greater distances from fibre networks and lower densities of premises and population reinforce barriers to investment in transformational digital infrastructure.

2. Opportunities

Consultation with partners in local authorities, universities and Network Rail Telecoms was used to map opportunities to improve digital network capability across the Coast to Capital LEP region and in neighbouring areas.

2.1 Existing networks and ongoing interventions

Burgess Hill Fibre Exchange

Burgess Hill – a very typical town, with a population of 30,000 and average density – was awarded Local Full Fibre Networks (LFFN) funding for its plans for a digital exchange in part because it offered a test case for the Department of Digital, Culture Media & Sport's (DCMS) ambitions to accelerate the market for fibre connectivity in 'average' settlements. Mid Sussex District Council's proposals provide a proof of concept for the type of locations which could offer themselves as exchange points for diverse fibre connectivity but that are not otherwise going to be prioritised by commercial communications providers, which are likely to prioritise larger markets with higher density, closer to existing networks.

The Burgess Hill project also acts as a test case for the use of experimental methods to accelerate the deployment of full fibre and reduce barriers to investment, including application of the cooperative asset sharing 'thin layer model' and a new 'Dig Once Trust'. (Both of these methods are explored in greater detail below.) The project will use public funds to construct a fibre ring in the town which will be made available on commercial terms to private sector communications providers and ISP which opt to become members of a 'thin layer' mutual (also known as a 'cooperative neutral host').

The project plan also proposes the development of a carrier-neutral digital exchange with a dark fibre connection back to BDX in Brighton, creating both an exchange point for diverse networks and a physical hub offering accommodation and access to data centre facilities for digital-tech businesses. This part of the project is currently at the modelling stage.

West Sussex Gigabit

The West Sussex Gigabit project is being delivered in partnership with DCMS under the LFFN programme. The fundamental aim of the project is to take a proactive approach to securing future proof technology that delivers the gigabit speeds that are likely to be required for delivering council services in the future and in so doing, extend the full fibre footprint within the county.

The West Sussex Gigabit Framework was established after a fully compliant tender process by West Sussex County Council. It is hoped that a larger footprint of full fibre will stimulate the provision of fixed line and wireless access by commercial operators across the county.

2.2 Planned interventions

Brighton 5G ring – Brighton & Hove City Council

This project will deliver on Coast to Capital's goal, as stated in its SEP, to establish a "5G fibre ring around Brighton & Hove to extend the reach of the Digital Catapult 5G Brighton Testbed." It will create a publicly owned, 5G-ready, shared-access duct infrastructure under the stewardship of Brighton and Hove City Council (BHCC) that links core strategic education, research and public sector assets including the Pavilion Estate, Preston Barracks, the MET and others.

This open access model will enhance business access to key university R&D resources, significantly augmenting the value generated from the existing 5G-testbed technology. The Brighton 5G Fibre Ring will allow connections with larger employers, digital and technology SMEs, and the wider public sector. The ring will create a scaffold through which to leverage other opportunities in 5G and fibre deployment, reducing fixed cost barriers to investment, and making effective use of government fibre funding (through the LFFN Voucher scheme).

At the ring's core will be an enhanced 5G Brighton testbed. The UK's first SME-accessible 5G testbed is an existing distributed facility, housed across the Brighton Digital Exchange, the FuseBox innovation hub and the Brighton Dome & Corn Exchange. The funding will significantly enhance its technical breadth and capacity, providing access for businesses and others, supporting them to design and develop new applications that utilise 5G to deliver value, growth and productivity gains for all across the region.

This investment sets a clear strategic direction. It delivers innovation-enabling infrastructure through a world-class 5G facility that businesses and organisations across the region will be able to access and benefit from and provides a means to kick-start and accelerate full-fibre in Brighton, while acting as a key asset in the deployment of infrastructure throughout the region.

Converged Fibre Connectivity Programme – West Sussex County Council

The Converged Fibre Connectivity Programme (CFCP), a County-wide initiative led by WSCC and supported by the District and Boroughs, will connect Crawley (including Manor Royal), Horsham and Haywards Heath to the Burgess Hill Fibre Exchange (BHFX) which itself provides a link to the Brighton Digital Exchange (the latter funded by Department for Digital, Culture, Media and Sport) which will connect to the Brighton 5G Fibre Ring programme. This will include a fibre spine and capacity for rural connections with Points of Presence along the route. While the area is well served in backhaul for 'transit' - transporting data traffic largely from point to point - there are currently limited break out opportunities for rural communities, businesses and to support fibre to telecoms masts for 5G. In addition, the route links Horsham, Crawley and Manor Royal, potentially accelerating and increasing the footprint of commercial deployments across this arc by enabling aggregation of premises and reducing capital costs for commercial network builders. The route will ultimately complement the ambition, expressed in Gatwick 360°, to support the development of the Brighton mainline as a digital railway, and thereby create the opportunity for a fibre ring in the economic hub around Gatwick. The CFCP aims to invest in mixed economy digital infrastructure to enable an extensive open-access fibre network, which will provide additional backhaul (and ultimately, resilience and market interest) in both urban and rural areas. The aspiration is that the extra capacity provided will also support 5G and related technologies and will be the 'scaffold infrastructure' from which new or improved connections can be made (getting 'future ready'). This overall aspiration and infrastructure will help to make a compelling case for further economic investment in the area, enhancing land values and unlocking growth opportunities in harder to reach communities.

Gigabit Coast – Adur & Worthing Councils

Gigabit Coast: Adur & Worthing will connect 83 council assets with 54km of future-proof optical fibre, delivering gigabit-capable speeds (1000Mbps) to council-owned locations throughout Adur & Worthing towns.

The project will also design, procure, and implement services to operate over the new infrastructure, which include:

- Internet service provider services.
- Free public Wi-Fi with ultrafast speeds in shopping areas, attractions, parks, and leisure facilities.
- Connected CCTV services replacing legacy, stand-alone CCTV.
- Replacement, ultrafast infrastructure for Community Safety (Police) Cameras.

This project will enable the development of plans to draw interest from mobile network operators (MNO) for the piloting and rollout of 5G; and will connect the West Sussex coast to Brighton and Brighton Digital Exchange. It will ensure new services are future proofed to support 5G and, subject to MNO's interest, develop strategies for improving public service delivery using 5G and Internet of Things (IoT) technologies.

Using the established West Sussex Gigabit Framework (WSGF), Adur & Worthing Councils contracted with Cityfibre to provide dark fibre to 83 Council assets and properties on a 30 year right-to-use lease. The project will benefit communities and the general public by enabling gigabit connectivity that will be used for enhancement and creation of digital public realm in town centres to increase footfall and dwell time as well as creating spaces for outdoor events. Further digital connectivity is expected to build on these foundations as the plans for a gigabit coast from Brighton to Portsmouth, and beyond take shape.

The councils' assets are in significant locations such as primary and secondary shopping areas, public spaces such as the seafront, and community centres and parks.

The network serving the public sector will remain owned by Cityfibre, which will thereafter maintain the fibre connections, but the council will retain a 30 year right-to-use the 83 fibre site connections (as its own and without restriction), sufficient to ensure it is obtaining best value for the council expenditure.

In other towns and cities, significant independent commercial investment has followed public sector similar local authority investments from a range of commercial operators. In benefiting the public in this way, it is Adur & Worthing Councils' ambition that private investors will seek to invest commercially and create an open-access fibre network and Point of Presence (PoP) that will increase choice for all residential and commercial premises.

Worthing and Shoreham have already been signalled for investment by Cityfibre as part of their £2.5bn UK investment plans and we would anticipate further investments to be made by other providers. All commercial investments will be entirely separate from the procurement of fibre to the council's estate, for which funding is sought.

Adur & Worthing Councils have ambitions to provide public WiFi from several sites included in the project. Its recent public connectivity survey (2019) revealed:

- Use of free Wi-Fi: 78% currently use free Wi-Fi facilities in shops/venues where it is available. The reasons include poor mobile data coverage (33%), data-bundle limitations, (63%) and/or for better speeds (20%). These services are patchy and fragmented and require multiple registrations, with personal data sharing to commercial companies.
- Would use town Wi-Fi services: 91% suggested they would be likely to use town Wi-Fi services if they were provided.

- Poor 3G & 4G coverage: 42% reported poor 3G/4G coverage (generally or in specific areas)

The responses suggest a free town Wi-Fi service would be welcomed and adopted by the majority, and that there are perceived 3G/4G coverage issues in the towns, preventing citizens from doing what they need. The survey also sought information on where people want to use Wi-Fi services; the responses support the initial design in terms of key places for the service.

The Wi-Fi service will involve the procurement of hardware and network services to deliver ultrafast WiFi, offering free connectivity to visitors and residents and enabling a range of innovative digital experiences to be offered by an ecosystem of suppliers.

West Sussex Rural

West Sussex is encouraging greater coverage of gigabit-capable full fibre infrastructure to support its economy to attract and retain businesses and allow new businesses to develop, as well as to give West Sussex residents high quality digital opportunities.

The Rural Connectivity project forms part of the West Sussex Full Fibre programme of works which aims to unlock coverage in rural, coastal and less densely populated areas by building resilient full fibre infrastructure. The project is likely to deliver a duct and / or dark fibre infrastructure, and the initial focus is between Chichester and Horsham with the opportunity to extend across the county region. The Council is currently conducting market engagement to consider a joint venture.

2.3 Strategic opportunities

The economic area around Gatwick

Gatwick – both the airport itself, associated transport and logistics networks and other businesses clustered around the airport - will very quickly be demanding scalable network capacity for services such as passenger information, to support 5G and data analytics of the movement of people, cargo and services in and around the airport. This calls for capacity and resilience that does not currently exist if Gatwick is to maintain and build upon its competitive advantage.

Mid Sussex District Council's Local Growth Fund bid includes plans for backhaul to Gatwick and Crawley – which would take advantage of the existing BDX - and plans for a further £20m development using Business Rates Relief, adding an exchange point at Burgess Hill, to provide resilient and scalable digital network capacity and allow businesses and public sector to purchase services all the way from Brighton to Gatwick.

Commercial investment in new infrastructure is beginning to address constraints in town centres toward to North of the Coast to Capital area. Openreach has recently announced that Epsom, Ewell and Burgh Heath will be included in their Fibre-First rollout.⁵

Brighton Main Line

Network Rail Telecom (NRT) is in commercial dialogue with suppliers about a project to install a large amount of fibre (400+ cores) along the Brighton Main Line (BML). This would provide capacity for Network Rail's own network management and uninterrupted high-speed cellular

⁵ <https://www.ispreview.co.uk/index.php/2019/07/openreach-unveil-36-new-uk-areas-for-ftp-ultrafast-broadband.html>, 31 July 2019

internet and mobile reception on trains and at stations from both London Bridge and Victoria to Brighton, via East Croydon. It could also make available 'dark fibre' for both backhaul (transit) and 'break in' points to that fibre. The opportunity to access dark fibre and other products could speed deployment and save costs in the development of 'spine' networks, improving digital network capacity not only close to the Brighton-Gatwick-London main line, but to the towns around Gatwick, the rural area and the coastal towns across Coast to Capital. Availability of fibre backhaul for MNOs will also provide a spur for development of 5G capacity both close to BML itself and in other places where the digital spine network extends across the region.

Network Rail received DCMS funding to build a similar fibre 'spine' along the Transpennine rail line. This has led to several developments that could benefit other areas, including:

- A commercial model of deployment that could be rolled out across the whole network.
- A catalogue of products and services, with clear pricing structures for fibre capacity not needed for operation of the rail network (eg, access to dark fibre) determined on a MEOP⁶ principle.
- A wholesale interface that would allow local authorities, communications providers and ISPs to access these products and services 'on demand' (in a similar way to which ISPs currently purchase access products from Openreach).

2.4 Opportunities in higher education

The LEP's three Higher Education Institutions (HEIs – the Universities of Brighton, Chichester and Sussex) are critical to the successful delivery of local industrial strategy (LIS). A single regional framework would further amplify their combined ambitions to play a pivotal role in accelerating the deployment and take up of digital network capacity across the region, not only for their own use and that of their students but also to stimulate demand for digital capacity amongst diverse business and residential communities.

HEIs across Coast to Capital all stressed the need for digital network capacity that reinforced collaboration and knowledge exchange not only between universities and digital SMEs, but also with the larger companies in other sectors in which Coast to Capital has core strengths. The scope of their ambitions covers all four main areas of LEP strategy – the Brighton-Gatwick London corridor, towns around Gatwick, the rural area and coastal towns – to create new innovation corridors across the region which link to strategic partners in neighbouring areas. There was a consensus that these types of collaboration were likely to provide 'quick wins' in productivity gains, which would reinforce the competitive advantages of a region whose distinctiveness lies in its strengths across sectors and in a mix of urban and rural locations.

University of Brighton (UoB)

The University is working with a commercial developer, U+I, on a major new development on the old territorial army site on Lewes Road (near its Moulescoomb campus), in partnership with Brighton & Hove City Council (BHCC). It offers a combination of new multi-storey student accommodation, a new business school and an adjacent commercial development by U+I. It anchors a model of innovation beyond workspace to provide everything from start up to scale up to R&D for larger organisations. UoB is leading a further £1m+ bid for an innovation programme to

⁶ MEOP – Market Economy Operator Principle – can be used to deliver legitimate State aid to undertakings in which the public sector invests to meet its own objectives whilst offering no advantage to any single commercial operator

link companies to high end University laboratory facilities. Social housing forms part of the plan to deliver regeneration of a deprived area.

University of Sussex (UoS)

The University is a member of the Russell Group of research-led universities, with research strengths in automation among others. Students increasingly rely on high speed Internet connectivity where they live - and the risk of a large-scale failure of Internet connectivity to the rapidly growing student accommodation sector is a risk.

- UoS has expressed its ambition to become a digital exchange and transit point between West and East Sussex and on the North-South axis of London to Brighton. It is looking at ways in which enhanced digital network capacity (both fixed line and 5G) could help it to better engage with businesses in all sectors, including agriculture and food manufacture, to drive innovation and productivity.
- As part of this, the University is exploring the potential to supplement or replace its existing use of JANET – a nationally-procured high speed fibre network for universities - on campus with a mix of its own and commercially procured infrastructure. The ability to aggregate HEI network spend with that of other public sector bodies would offer further competitive advantage and distinctiveness to the Coast to Capital proposition.

Innovation corridor

There is potential to create an Innovation Corridor linking up the Universities of Brighton and Sussex campuses, and facilities such as the Sussex Innovation Centre (UoS) and the Advanced Engineering Centre (UoB), between Falmer and Moulsecoomb.

A sandbox for application of digital technology across the economy

Consistent with the aim of developing a distinctive industrial strategy to leverage Coast to Capital's diversity in sector and density, the region could benefit from a 'sandbox' for applications of transformational digital infrastructure in other industry sectors – environments for collaborative research and development that give businesses from all sectors access to the knowledge base within local universities and the private digital-tech sector.

A 'sandbox' is a way to allow businesses (particularly early stage and microbusinesses) to work in partnership with research partners to test innovative propositions and service in the market, with real customers. It can take both physical forms – a centre where companies can work with university researchers – and 'virtual' forms – where a university or commercial partner sets up an online platform to bring together the inputs of collaborative teams. It results in customer-focused innovation and helps accelerate the translation of university research into commercial products.

During the course of the consultation, university partners emphasised the importance of extending opportunities for this type of collaboration not just to start up (or even scale up) businesses within the digital tech sector; but also to large companies in other high productivity sectors (such as advanced manufacturing and professional and financial services) that could address the concerns about a growth and productivity gap emerging between Coast to Capital and other regions.

Diverse physical sandbox locations could catalyse delivery of full fibre digital connectivity networks in diverse locations – urban, semi-rural, rural and coastal – across the region, potentially connected to development of additional DX and DX-PoP locations. These could become a distinctive part of Coast to Capital's digital infrastructure, rather than stand-alone facilities.

Sandboxes could offer physical hubs for partnership between universities and colleges across the Coast to Capital area and points of access to interventions around digital skills and awareness for businesses and communities. Coast to Capital identifies that many SMEs, across all sectors of the economy, lack the knowledge, understanding and access to systems that will make a difference to their productivity.⁷

2.5 Public sector transformation and savings

For the public sector, open access to new digital connectivity and infrastructure enables service transformation through innovation and, by collaborating with others, enables cost savings through shared common infrastructure.

Public service transformation results from providing fully open access to fibre infrastructure, which enables the development of new services at low incremental costs. This frees the public sector from the bandwidth-use pricing model normally applied by telecoms providers. New types of data exchange and collaboration are made possible through access to shared infrastructure with resource sharing and closer coordination.

By having access to shared and/or publicly owned passive infrastructure, public sector bodies can make significant savings compared with procurement of ordinary bandwidth services.

Coast to Capital contains several large public service delivery sites that offer potential to start to construct local spine networks. Examples of these are:

- East Surrey Hospital houses 4,000 employees and the major trauma centre for the sub-region. Connecting it to other primary care services (GP surgeries, etc) could have a transformational effect both on service delivery, innovation and demand for fibre to the premises (FTTP) across a much wider area.
- The potential for public sector data centres and disaster recovery centres – such as Surrey County Council's facility in Salfords – to be developed as digital exchanges (DXs). These would provide a series of physical exchange points for new spine and local access networks (including points of presence for 5G backhaul), offering diverse connectivity and an opportunity to develop local digital-tech clusters. This model of investment has been used in partnership by Tameside Council and the local NHS Trust to underpin the development of Ashton Old Baths in Greater Manchester, which also provides a combined

The government's strategy emphasises the importance of 5G development alongside full fibre. 5G is commonly assumed to be like 4G, only faster; but it has some distinguishing characteristics. The development of 5G is driven by three main 'use cases':

- EMBB (enhanced mobile broadband) - fast, wireless broadband, like 4G, but faster and 'converging' with wifi.
- MMTC (massive machine-to-machine communications) — many devices connected at slow speed and using little power, used for Internet of Things applications;
- URLLC (ultra-reliable, low-latency communications) - low-latency connections that never fail, used for example for autonomous vehicles).

⁷ Further detail on skills gaps is expected to be provided through the Coast to Capital Skills and Labour Market Research being carried out in parallel with this study.

data and disaster recovery centre for both organisations, whilst also providing a hub for digital-creative businesses.

2.6 5G deployment

5G networks are heavily dependent on availability of fibre; the government's strategy accordingly envisages 5G development alongside full fibre infrastructure.

As well as offering much faster mobile data services (requiring more cell sites, each of which requires backhaul), 5G offers other benefits such as longer-range services for rural areas, high-reliability connections for autonomous vehicles and low-cost, low-power connections for Internet of Things applications.

5G also offers the potential for new ways of network infrastructure sharing. Deployment of new, shared fibre infrastructure offers an opportunity to accelerate the deployment of 5G locally.

2.7 Electric vehicle charging

The total cost of ownership of a new electric car is already lower than its fossil-fuelled equivalent. Aside from the target already set by the government to phase out production of new fossil-fuelled cars and vans by 2040, market forces will drive accelerated adoption of electric vehicles in the coming years.

Widespread adoption of electric vehicles will need new infrastructure for charging and will significantly increase demand on the electricity distribution infrastructure. There will be a need to lay improved cabling in many areas; and charging points will need connectivity for billing and monitoring. This offers an opportunity to deploy new fibre as part of a 'dig once' strategy.

2.8 Infrastructure for autonomous vehicles

Electric vehicle adoption will run alongside and help accelerate increasing automation, active traffic management and autonomous function of vehicles. This will require ubiquitous connectivity for traffic management, sensors and to vehicles themselves. A forward-looking infrastructure strategy can help accelerate this and reduce cost. Dig once methods can accelerate deployment and reduce the cost of new traffic management infrastructure alongside fibre for new digital connectivity networks.

2.9 Funding opportunities

Local authorities in the LEP area have been successful in bidding for funding from different sources, including:

- DCMS Local Full Fibre Network (LFFN) Funding.
- Ministry of Housing, Communities & Local Government (MHCLG) Business Rates Retention pilot.
- UK Research & Innovation (UKRI) funding for the 5G testbed at Digital Catapult in Brighton.

Partners continue to compete for available public funds – including the bids from Adur & Worthing, Brighton and Hove City and West Sussex County Councils to the Local Growth Fund.

The National Productivity Investment Fund (NPIF) has supported different telecoms programmes, including:


- £200 million for the Local Full Fibre Networks Programme (LFFN).

- £200 million for the Rural Gigabit Connectivity Programme (RGCP).
- £160 million to support for 5G development.
- £35 million to improve connectivity on trains (combination of mobile and fibre broadband).

Competition for public funding is always intense. Some partners in the LEP are already exploring

Figure 2. Business Rates Retention Pilot

other innovative models to combine existing capital budgets, or to invest in network infrastructure as way of reducing future calls on revenue spending, as demonstrated in the Business Rates Retention pilot, summarised in Figure 2.



West Sussex has successfully been selected as a 75% business rates retention pilot in 2019/20 by the Ministry of Housing, Communities & Local Government (MHCLG). The joint bid with the County Council and all District & Borough councils West Sussex plans to use the funding to invest in digital infrastructure to accelerate the deployment of fibre and support 5G technologies to support its economy. The central element of this plan is to enable a county-wide open access fibre loop to provide additional backhaul options in key areas. The open access fibre will allow operators, communities, public and private sector to use different models and approaches to investment to build out to towns and villages across the region to provide connectivity. The aspiration is that the extra capacity provided will be able to support 5G and related technologies and will be the scaffold from which new or improved connections can be made. This overall aspiration and infrastructure will help to make a compelling case for further economic investment in the area.

3. Gaps analysis

This section seeks to identify barriers to investment and reasons why Coast to Capital may have been relatively disadvantaged in relation to other areas in terms of investment in digital network capability. Some of the gaps are generic to the telecoms market in the UK; others are specific to Coast to Capital, and in many cases determined by its unique topography and the dispersed and relatively less dense nature of development in the region.

3.1 Path dependencies

Path dependence explains how a set of decisions (in this case, concerning commercial investment in new digital telecommunications infrastructure) can be constrained by decisions taken in the past, even where the circumstances that influenced the original decision have changed. Path dependency for commercial communications providers typically results in an inability or reluctance to commit to change – in the form of new digital infrastructure investment – because of the cost implications, even where the investment would result in a better economic outcome.

Fibre network builders are faced with a profitability gap. Deployment of duct and fibre is expensive except in limited special circumstances - for example, new build. However, new infrastructure can be funded if networks are able to generate sufficient revenue flows.

Revenues can be generated by deploying an 'access network' in an area that is poorly served; however, backhaul (spine) connectivity is then needed to serve the access network, which can severely impact costs. There is thus an incentive to build to cover adjacent areas that may already have spine connectivity, which leads to overbuild and infrastructure competition that depresses profitability.

A path dependency results that has held infrastructure investment back.

There is a parallel problem which exacerbates these retarding effects:

- The need to extract maximum revenues from deployments leads to a focus on exclusivity.
- The choice offered to consumers is between multiple providers using the existing infrastructure and a single provider using the new infrastructure.
- This inevitably leads to low take up rates for the new infrastructure, further increasing the profitability gap.

There is a further path dependency: it makes sense during construction projects, such as housing and business developments, infrastructure upgrades and developments, to install fibre ducting while the ground is open. This leads to savings typically greater than 80% compared with installing the same duct later. However, such opportunities are rarely linked in any coherent way; the new duct deployed is therefore, at least temporarily, a 'stranded asset';

The business case for such deployments is therefore dependent on the potential later to link these assets at some unknown time. This path dependency can be successfully addressed through public sector efforts, working in partnership with commercial operators, to provide a mechanism that incentivises or mandates installation of duct for future use but for which the business case is unclear at the time of installation. This method of 'dig once' accretion and stewardship" is described in more detail at Section 6, below.

3.2 Backhaul

'Backhaul' is the term used to describe high capacity connections from a local access point, such as an exchange or mobile phone mast, back to the internet. Lack of availability of cost-effective 'backhaul' is a major barrier to investment in new access network build that offers fibre to the premises (FTTP) connections of a kind that can deliver 'future proof' and Gigabit capable services. While major telecoms providers, such as Openreach, offer backhaul products based on their own spine infrastructure, these are bandwidth-priced – i.e., its price is calculated on the basis of the service consumed, not the cost of the infrastructure. This presents a significant fixed cost and reinforces the 'path dependency' described above, in particular for more remote or less densely populated communities, which leads to a failure to invest in poorly served areas.

Other large investors, such as Virgin Media, will generally install their own spine infrastructure where none yet exists in order to be able to offer a 'vertically integrated' service – i.e., one in which the operator owns and manages all parts of the supply chain. This again provides a major barrier that undermines the investment case in many areas - particularly rural areas, but including some urban centres (eg, Brighton) where a single operator has a preponderance of 'legacy' copper and hybrid (fibre and copper) networks.

3.3 Barriers specific to Coast to Capital

Local authorities we spoke to have a sophisticated understanding of the impact that the distinctive make-up of the Coast to Capital economy, whose strengths are distributed across several smaller and less dense towns and settlements rather than concentrated in a single metro centre, has on commercial investment in fibre network infrastructure.

However, that has not yet resulted in a cohesive approach. Areas where barriers exist include:

- Relative lack of demand for commercial digital network capacity in less dense rural and coastal settlements.
- Cost of delivering network infrastructure to more remote areas of West Sussex and East Surrey.
- Attempts to secure investment in new full fibre infrastructure in Brighton's city core are constrained by lack of investment in FTTP by incumbent operators, whose market dominance has a 'chilling' effect on competition.
- Lack of coordination of public sector networks – delivered by separate contracts with different operators – limits opportunities for local authorities to come together to consider the business case and budget savings from building and owning infrastructure and operating their own services rather than paying a service provider.
- Information asymmetries – residents and businesses are less aware of the potential benefits of FTTP, with the result that take up of funding opportunities such as the DCMS-backed Gigabit Voucher Scheme (which provides a grant of up to £2500 to business and £500 to households to meet the high initial cost of installation of 'full fibre' connections) has been low.

West Sussex County Council (WSCC) reported several specific barriers and information asymmetries that hinder expansion of digital network capacity:

- The relatively less dense nature of settlements in West Sussex, even larger towns, makes the area a relatively low investment priority for full fibre operators.

- Lack of passive infrastructure access (PIA – which provides a commercial framework for other operators to use Openreach’s ducts and poles to extend network coverage) is a constraint in more rural areas.
- Lack of access points to allow ISPs to ‘break into’ backhaul connections from towns and rural areas to ‘points of presence’ where they can connect into wholesale network operators, such as SSE, which provide ‘transit’ connections to main internet exchange points (ie London Internet Exchange, or LINX).
- Consumers would benefit from a more competitive market; open access infrastructure made available by the Council would further lower barriers in some areas.

A more widespread problem for Coast to Capital is that poor connectivity in smaller towns and villages forces employees (particularly around Brighton) to travel into urban centres, which creates additional journeys and cost for them, worsens the environmental impact from travel and places further pressure on transport systems already heavily loaded by the higher than usual rates of out-of-area commuting for work opportunities, especially to London.

Coastal towns have a specific set of barriers relating to lower levels of higher-level educational attainment, lower-than-average wages and a ‘digital divide’ reinforced by poor digital network connectivity⁸. However, these towns offer the region both capacity and potential to boost employment and GVA if given the opportunity to develop. Deploying strategic digital infrastructure alongside existing investments – for example, adding a DX-PoP to proposals to develop new workspace at the station in Bognor Regis – could provide backhaul to accelerate commercial investment in fixed line and 5G connectivity across the coastal strip as well as providing resilience to existing plans for spine networks across the rural areas.

⁸ Coast to Capital Economic Profile 2017.

https://www.coast2capital.org.uk/storage/downloads/coast_to_capital_economic_profile_2017-1517388688.pdf

4. Theory of change - the argument for intervention

This report draws upon initial insights from the document and strategy review and interviews with the LEP, local authorities, universities and other commercial partners.

The scope of this report only allows us to summarise and highlight examples of the very large number of initiatives and strategies that are under way across Coast to Capital. But even this summary allows us to draw some conclusions about the impact that a strategic change framework for digital connectivity could deliver across all areas of the region and all sectors of the LEP economy.

We have summarised our findings and analysis in a draft theory of change. This describes the case for investing in digital connectivity in Coast to Capital, illustrating how investment and support activities can lead to measurable change and contribute to wider strategic objectives. The high-level diagram overleaf sets out:

1. The key contextual factors and challenges that have been identified.
2. Examples of existing and planned digital infrastructure and assets that provide the skeleton for the framework, along with additional ideas to explore through consultation.
3. Outcomes which have been structured around key themes of the strategic economic plan and that reflect stakeholder priorities (as expressed in a series of telephone interviews undertaken in June and July 2019).
4. The impacts emerging from investment in digital connectivity, focused on improving productivity and aligned to the critical path for development of the Coast to Capital Local Industrial Strategy (LIS).

Figure 3. Theory of Change

Key Challenges and contextual factors

- Diverse and dispersed **commercial hubs** (and the connectivity between them)
- **Key opportunity areas** – Brighton-Gatwick-London corridor, the towns around Gatwick airport, the coastal towns (with Brighton as a key driver) and the rural area - have widely varying capacity and demand
- **Working patterns** – commuting out of the Coast to Capital area
- **Timing and distribution** of major capital developments and regeneration areas
- Settlements of lower density than major cities
- **Undersupply of business premises** with Gigabit capacity
- **Business base** is diverse, dispersed and made up predominantly of micro-businesses
- **Barriers to remote/ home working** for local employers
- **Inequality of access** to employment opportunities (including home and remote working)
- Likely impact of **Brexit**

Activities and outputs

Building on existing activities and assets, deliver focused, coordinated approach to digital network capability ...

Opportunity mapping – across all four priority areas - mapping digital network capability of existing places, new developments and regeneration plans for town centres and rural communities for business, residents and public sector users

Hubs and clusters within the LEP and strategic partner areas, and their digital connectivity to **research and innovation capacity** in HEIs

Gaps analysis – highlights opportunity cost of uneven distribution of digital network capacity and suggests place-specific methods to address them

Mixed economy model – a place-based view of how a range of network infrastructure (eg, spines, loops, digital exchanges and hubs), methods (eg dig once, user aggregated investment) and business models (eg Public Sector Anchor Tenancy, fibre cooperatives) can best combine to accelerate deployment of Gigabit digital network capacity

Investment support - combining public, private and aggregated user investment to aggregate demand and accelerate deployment

Outcomes

to enable the conditions for businesses, public services and residents to build on the competitive advantages of the Coast to Capital LEP area...

Networks - Diverse digital networks that offer the end user a competitive market in products and services (eg, Gigabit connectivity and dark fibre) across all four priority areas

Skills - Attract and retain skilled workforce in a diversified economy, drawing on local talent that is currently drawn disproportionately to work opportunities in London

Growth - Economic growth within the LEP area - GVA, employment, number of businesses, start ups

Research and innovation - innovation hubs, increasing enterprise connection to relevant higher education and larger companies, contribution of digital innovation and skills across a range of industries grows.

Place - Embedding digital network capability into existing places, new developments and regeneration plans for town centres and rural settlements

Communities - residents - particularly in more remote/less dense settlements - able to engage more effectively with public services delivered online

Investment - Ubiquitous fibre backhaul provides spur to private sector investment in 5G and next generation WiFi in all parts of the region, boosting town centres and visitor economy

Impacts

and contribute to delivery of the other priorities of the Coast to Capital Local Industrial Strategy

Distinctiveness
A model of sustainable, place-based growth based on using digital connectivity to drive productivity, innovation and skills across distributed and diverse sectors (including those in the rural economy) rather than focusing on a single core city as the driver

Core strengths
Strengthen cross sector collaboration between digital SMEs, medium/large companies and HEIs in building smart specialisation to **pioneer innovation in core strengths** and drive productivity growth in all parts of the economy and across the whole LEP region

Deliver prosperous urban centres across the LEP region and **invest in sustainable growth** of lower-density, rural and coastal settlements

Create skills for the future
Digital hubs and HEIs combining to develop and grow a highly skilled and digitally-literate local workforce within and across the Coast to Capital LEP area

Place
Deliver on the spatial and strategic priorities of Local Industrial Strategy and build on the advantages of **better transport and mobility**, building on the core strengths of the LEP economy; reducing risk of displacement of businesses and negative environmental impacts of outward commuting

5. Mixed economy model

5.1 Definition of the mixed economy model

The mixed economy model is a way of understanding how different commercial and investment drivers can be combined to overcome barriers to investment in fibre digital infrastructure.

It brings together in a single framework:

- Existing networks and ongoing interventions.
- Planned interventions.
- Known gaps.
- Strategic opportunities.
- Different models of ownership.

The mixed economy model incorporates, recognises and reflects the more sophisticated understanding of commercial, investment and deployment models that exists amongst partners across the Coast to Capital area. This has been stimulated both by their engagement with the market in the process of establishing the business case and viability for existing interventions to extend full fibre network capacity; and by collaborative action around the Business Rates Retention pilot.

5.2 Methods

Partners across the Coast to Capital area have already begun to adopt one or more of the following methods to help coordinate public sector and private investment in improved digital network capability:

- Methods that can be used to lower barriers to infrastructure deployment – eg, **‘dig once’ stewardship**.
- Methods that can be used to ‘tip’ the business case for commercial investment in less densely populated or more remote areas without increasing the cost of network development to the public sector – eg, **aggregated user demand and investment**.
- Methods that anticipate changes in strategic network management by placing more capacity in centres at the edge of networks that provide both greater resilience, improved access to a full value chain of infrastructure, products and services and more local control over development of local access networks – eg, **digital exchanges and DX-PoPs**.
- Methods that can be used to ‘piece together’ infrastructure under different ownership and built at different times to build a robust and resilient regional spine network that offers higher levels of digital network connectivity to a wider area and larger number of premises (public sector, business and residential) that could be achieved by commercial investment or publicly-funded network interventions acting independently of one another – eg, **cooperative neutral hosts**.

5.3 Criteria

The methods outlined above (and described in more detail at Section 6, below) can be used individually or in different combinations to break existing path dependencies that create barriers to

investment. A shared strategic framework for collaboration and joint action should look to consider any potential investment using the following criteria:

- The business case for any investment by local authorities and other public bodies should be informed by modelling its economic, social and environmental impacts - investment in shared access network deployment should be on the basis that higher take-up rates shared across multiple areas will benefit all.
- In the first place, priority should be given to creating a shared spine infrastructure that is equally available to all and serves no single commercial interest.
- All plans should include a 'dig-once' policy both in the planning of any direct intervention and across the LEP area; this ensures that assets (ducting) can be installed at lower cost during other construction projects and infrastructure upgrades, and guarantees shared access to these assets when they become useful.
- The value of investing in capital infrastructure needs to be assessed against four criteria:
 - As a way for public sector bodies to address their own connectivity needs.
 - To generate savings and revenue in the short to medium term.
 - To deliver innovation in public services.
 - To leverage secondary and tertiary economic, social and environmental benefits.

State aid

Public sector partners should seek to mitigate State aid risk in any public intervention. But this does not mean that they cannot benefit from their investment in capital infrastructure, both through cost savings that can be reinvested in other digital network capability or in delivery of other services, or in the form of a direct economic return on their investment.

All public sector asset reuse (PSAR) models supported by DCMS allow for reinvestment through the Market Economy Operator Principle (MEOP). The cooperative neutral host (or 'thin layer') model presents public sector partners to benefit directly from returns on their investment under the Market Economy Investor Principle (MEIP). Both principles are described in more detail at Section 6.4, below.

STATE AID

"State aid can have a crucial role to extend adequate broadband services to all European citizens – no matter whether they are living in large urban areas or in small villages."
(European Commission, 2009)

5.4 The role of public sector stakeholders

Local authorities and other strategic partners can use the mixed economy model in preparation and appraisal of business cases, at all levels from individual public buildings to regional and strategic networks development, to assure themselves and other investors that the risk of duplication of effort and overbuild of existing fibre infrastructure can be mitigated by a commercial framework in which they can play different roles: variously, provider, customer and partner for physical duct, dark fibre and services.

Stakeholders in this mixed economy model can fulfil multiple roles, principally three:

- Contributors have assets (such as fibre ducting) that can be shared in exchange for rent.
- Users wish to buy access to the products that the shared infrastructure makes possible (such as dark fibre or colocation).
- Investors can help the organisation extend the network in return for a financial return, potentially linked to other benefits (for example, improved connectivity.)⁹

A fourth role is a special type of contributor that co-invests in the construction of new assets (for example a trench-share agreement). There may be multiple opportunities for local authorities and other public bodies working, for example, with Network Rail Telecoms and other commercial operators. The table below (*Figure 4*) summarises the key stakeholders and their potential roles.

5.5 Governance

Dig once stewardship

All plans should include a 'dig-once' policy both in the planning of any direct intervention and across the LEP area; this ensures that assets (ducting) can be installed at lower cost during other construction projects and infrastructure upgrades, and guarantees shared access to these assets when they become useful. A more detailed description of dig once stewardship is given at 6.1, below.

⁹ Blackpool has made significant investment on this basis with substantial savings

Figure 4. Stakeholder roles in a mixed economy model

Stakeholder	Contributor	User	Investor or co-investor
Local authorities	Space for DXs and DX-PoPs; Space in existing duct; Space in new duct created using dig- once	Potential to use dark fibre and colocation for internal purposes	Invest to reach new premises rather than building own duct; Invest for 5% return; Invest for revenue share.
Universities	Duct space, fibre swap	Use dark fibre to provide backhaul to eg student accommodation	Invest to reach new premises rather than building own duct
NHS and other public bodies		Use dark fibre for point-to-point connections to sites	
Network builders (eg Network Rail)	Duct space, fibre swap, wholesale communications products	Use dark fibre for backhaul	Trench share on new build
ISPs and operators (eg Virgin Media, ITS Technology Group)		Use dark fibre for backhaul	Invest to reach new premises rather than building own duct
Network builders (eg Network Rail)	Duct space, fibre swap, wholesale communications products	Use dark fibre for backhaul	Trench share on new build
ISPs and operators (eg Virgin Media, ITS Technology Group)		Use dark fibre for backhaul	Invest to reach new premises rather than building own duct

6. Methods

The UK telecoms market is in a state of constant innovation, and new models continue to emerge. Local authorities across the Coast to Capital area have begun to deploy some of the methods described below in their attempts to improve digital network capability. Coast to Capital could potentially accelerate deployment of new digital infrastructure by offering a shared framework that provides a trusted and neutral point of governance that can coordinate the investment of local authorities, other public sector users, universities and commercial operators to amplify the direct and network effects of improved network capability.

6.1 Dig Once Stewardship

Dig once stewardship mechanisms have been used successfully in the US, and now in some UK cities, to deploy fibre-duct infrastructure at minimal cost. They do this by addressing opportunities to install ducting for fibre at very low cost.

By far the largest cost in full-fibre infrastructure deployment is digging the trenches within which duct can be laid (see

Figure 5). In comparison, the cost of ducts, sub-ducts and fibre are marginal.

There is an opportunity to install ducting at much lower cost when digging is already taking place; for example, when developers construct new housing or business developments, or when local authorities build new roads, upgrade, or create bus corridors. Duct could also be installed when utilities companies dig up the roads to upgrade or deploy other infrastructure.

To seize this opportunity, several US cities have created 'dig once' ordinances. San Francisco, for example, requires: "the installation of City-owned communications infrastructure in excavation projects where the City has determined that it is both financially feasible and consistent with the City's long-term goals to develop the City's communications infrastructure." In Sandy in Oregon, Council Member Jeremy Pietzold noted that his only regret about the new conduit ordinance is that, "Sandy did not have the forethought to pass it 10 years ago".

There are obstacles to progress in the UK. Local authorities are wary of undertaking a role constructing digital infrastructure, fearing that they do not have the competences to maintain and commercialise it. Developers are similarly wary, preferring to leave these questions to telecommunications operators like Openreach.

Dig once requires a long-term view. It may be years before some parts of the infrastructure can be brought into use. A business case based solely on local authority requirements for communications services requires a similar long view and may struggle to marry needs with solutions - although the experience in Tameside MBC, which has operated a dig once trust for five years, shows that isolated ducts are already being brought into use through this method.

Operation

Dig once stewardship models all operate in a similar way, although they may have different models of governance (see below.) They establish a body that is charged with the creation of a shared duct asset and with making that asset available to national and local carriers and internet service providers. It can coordinate a number of roles:

- To hold assets 'in trust' until such time as they can be brought into use.
- To provide technical expertise in the administration and commercialisation of the growing network.
- To stand as a neutral intermediary between stakeholders.

It is concerned solely with the assembly, maintenance and rental of a duct network. It does not get involved in service provision or network operations. It charges rental fees (eg, to communications providers) to access the ducting. Revenues are used to cover costs, including the marginal cost of duct installation in open trenches, to return a share to property owners, and for reinvestment in the network. The outcome: a growing network of duct available for sharing.

The stewardship body can be charged with different missions, depending on the stakeholders involved. For example, duct space may be made available on purely commercial terms, or some elements may be reserved for public sector use, or limits set on the amount of asset made available to any one user. One standard 100mm duct can be populated with sub ducts and can contain many hundreds of dark fibre pairs. This allows a diverse range of options.

Dig once will complement and accelerate commercial investment through the other models described below and are practically indispensable to the effective operation of the cooperative neutral host (thin layer model) set out at 6.4, below. Tameside MBC, which established a dig once

trust five years ago, initiated a cooperative neutral host as a way to keep part of the asset available for shared use by public sector and smaller digital and service provider businesses. Remaining capacity can then be offered in larger blocks. The experience in Tameside already demonstrates how isolated ducts have been utilised in commercial deployment of new digital connectivity network in both public and private sectors.

Governance

There are three main options for Coast to Capital to accelerate investment in and accretion of duct through dig once. Although they have different implications for the levels of responsibility and accountability required of local authority and LEP partners, they share a common outcome: a growing network of duct available for sharing.

To be effective, 'dig once' methods require the 'buy in' of local political leaders and senior officers to support consistent application of the method across all areas of the Council's statutory duties that could be touched by installation of new duct infrastructure, including planning, transport and housing. Local authorities will need to take advice and support of their own officers or independent experts to determine whether the mechanisms can have an enforceable mandate or only an advisory role in these respective areas; and any stewardship body should take into account independent commercial input to ensure that it can command the confidence of service providers and public sector partners, and service providers, potentially including utilities.

Where the dig once stewardship body is an arm of the state, leaders and officers need to determine where responsibility lies for its effective and accountable administration. Where it is an independent trust, local authorities will need to ensure that it remains accountable within scope of their existing duties and policy frameworks.

Any one of the models of governance set out below would enable economies of scale by providing a mechanism through which several public bodies in a locality or region can hold 'in common' the duct network accreted through the application of 'dig once' ordinances.

1. Dig once trust

It is possible to deliver effective dig once stewardship by introducing a new body – a **dig once trust**. A dig once trust is a neutral body, charged with the creation of a shared duct asset and with making that asset available to carriers and service providers.

The trust body¹⁰ is not an arm of the State; but its members can include all the public bodies that wish to collaborate in the creation and accretion of duct and benefit from its shared use. It can be charged with different missions, and cover geographies ranging from a single local authority to a whole region, depending on the stakeholders involved.

Tameside MBC has been operating its own dig once policy for over 5 years: isolated sections of duct installed in the past have now come into use.

2. Arms-length public body

Other local authorities – including Mid Sussex District Council – have opted to establish their own 'arms-length' dig once stewardship bodies. This is a separate body, controlled by the local

¹⁰ The word 'trust' is used in this document, but a variety of bodies can undertake the stewardship of such an asset, such as a Community Interest Company or mutual.

authority, which adopts and manages the duct in the same neutral way as a dig once trust. This structure is designed to:

- Mitigate concerns over State aid risks that may ensue from any investment the public body wishes to make in duct for its own purposes that is then also let for commercial use.
- Instil confidence in commercial suppliers and network operators – including utilities – that they are not simply ‘handing over’ assets to the Council.

3. Public sector alliance

A third option exists for a partnership of local authorities to come together to create a mechanism through which they own in common the duct network created by dig once policies and ordinances across their combined geographical area. This could be either an independent trust (as in option 1) or an arms-length body of one of the authorities (as in option 2) mandated to act in the interest of all partners. Existing governance mechanisms around the West Sussex Rates Retention pilot may provide the basis for this kind of body.

Dig once specification

Dig once stewardship bodies can also provide guidance to reduce uncertainty amongst investors – particularly non-telecoms specialists, such as housebuilders – about the type of ducting that should be installed.

The recommended specification varies according to the type of network being deployed. The specifications in the table below are based on government recommendations for local spine and access networks:

Figure 5. Dig once specification

	Main spine	Local spine	Access network
Application	Long runs (> 5km) linking settlements	Strategic deployment within conurbations, generally in loops	Connecting premises
Duct	Twin	Single or twin	Single
Size	110mm	110mm	Internal 30 - 90 mm
Colour (if possible)	Cyan	Cyan	Cyan
Depth	> 450mm (carriageway)	> 450mm (carriageway)	> 450mm (carriageway)
Chambers	> 100m depending on urban density	<100m	<75m

The examples below give some indication of how the variation in specifications can vary. Public sector 30km figure-8 local spine loop serving urban area:

- 110 (94)mm x 6m twinwall HDPE green pipe and 96mm smooth PVCu duct to house the cables with a blue draw chord placed in each length.
- Chambers: NAL Stakkabox box system in various sizes, spaced at approximately 100m intervals or changes in direction.
- 450 x 450mm boxes are recommended as a minimum but can use 300 x 300mm boxes (if there is significant utility congestion) and if the cables go straight through.
- Splice pods at no more than 500m spacing with 1200 x 600mm boxes.

Private sector long-haul spine serving multiple carriers passing through dense urban area:

- 110mm Emtelle ducting grey.
- FC1 (1 lid) chambers in brick or concrete construction.
- Depths of cover – 350mm in footway or verge, 600mm in carriageway.

6.2 Aggregated user investment

Aggregated user investment enables businesses and consumers to ‘crowd fund’ the creation of fibre infrastructure, typically by buying shares in a cooperative. Investors are end users who primarily want a better service but can also receive a return on their investment and may be able to qualify for tax relief through the Enterprise Investment Scheme (EIS).

Investment amounts vary but as a guide, FTTP networks cost between £500 and £1,500 per premises connected to construct. It is (at time of writing) possible for end users to claim government Gigabit Vouchers for all or part of their investment.

This approach is well proven and tested by Broadband for the Rural North, which has used aggregated user investment and cooperative structures to fund community-led development of fibre infrastructure across some of the most rural parts of Lancashire and the North Pennines.

The cooperative neutral host model (see 6.4, below) offers an opportunity to extend the aggregated user investment model to urban and semi-urban areas so that business clusters as well as residents can fund the creation of passive infrastructure. Space is then rented to the cooperative neutral host which deploys fibre for shared use by its member ISPs and telecoms service providers. Other providers could also rent space in the ducting.

6.3 Digital exchanges (DX) and DX-PoPs

Full fibre and 5G networks need new, neutral exchange points.

The Internet is an 'Inter-net', made up of smaller networks that exchange traffic using an agreed protocol (IP). This structure has been a principal factor in the rapid growth of the Internet, its capacity to support innovation, and its resilience. You don't need permission to develop a new application using the Internet protocol, and you don't need permission to connect a new network and exchange traffic with everyone else. Once on the Internet, packets of data can take multiple routes to their destination depending on current traffic and network conditions.

In the UK most broadband Internet services are delivered through telephone or cable TV connections - networks that were built in the 19th and 20th centuries - or through the cellular wireless networks. These are monolithic, hierarchically structured networks, generally owned and operated by a single supplier. They are less open for competition and innovation, and generally less resilient.

Now the UK is embarking on the construction of new full-fibre and 5G networks better to connect people with the Internet and serve future needs. Networks need aggregation and exchange points. To support rapid deployment of these new networks, they will need new shared, neutral exchange points where they can connect with each other and with the rest of the Internet.

Exchange points can provide a focus for innovation and collaboration. Like a marketplace or trading exchange, an exchange point is an agreed, neutral place to meet. Successful exchanges are near the markets they serve, and successful Internet exchanges in places like London, Amsterdam and Manchester have grown alongside thriving digital business sectors.

The agreement on a shared, neutral location is a crucial first step in making a successful exchange point. By agreeing on a place where local networks can meet and connect with the rest of the Internet, interested parties such as local authorities, ISPs and network investors can improve the business case for investment in new local fibre and wireless network infrastructure. By choosing a location where digital businesses can cluster, a virtuous circle can be created: demand for connectivity attracts competing carriers and ISPs, which in turn makes the exchange point an ideal location to host Internet applications and services.

This type of virtuous circle explains why some major cities like Manchester developed as Internet hubs, offering low-cost Internet 'transit' and hosting and supporting the development of digital and tech-creative business, and why other cities didn't.

With the deployment of new, dense, full fibre and 5G networks, similar virtuous circles will distinguish the districts, suburbs and smaller towns that will attract innovative digital and tech businesses, from those that won't.

A Digital Exchange brings together three critical elements:

- A shared, neutral, access point where investors – whether public or private – can terminate fibre connections¹¹ and co-locate the equipment needed for network operations.
- A shared, neutral¹² hosting facility where digital businesses can co-locate server equipment, to take advantage of the concentration of connectivity and opportunities for high-volume data exchange.
- A mutual ownership and governance structure to support sustainable operation of the facility, to guarantee continued neutrality and to encourage collaborative business development and innovation.

These elements are present in DCMS-financed Digital Exchange developments in Brighton and Ashton-under-Lyne (Greater Manchester), and in plans for Digital Exchanges in other locations.¹³

6.4 Cooperative neutral host (the ‘thin layer model’)

Cooperative neutral hosts are a form of public sector asset reuse (PSAR) approved by DCMS. They can be used to allow public bodies to invest in new digital connectivity network without distorting competition. The thin layer model – as developed by Tameside Metropolitan Borough Council over the last five years, and successfully commercialised through Cooperative Network Infrastructure - allows multiple owners of the ‘passive’ layer of telecommunications infrastructure whilst promoting competition amongst wholesale suppliers and internet service providers.

Public networks can be seen as having three ‘layers’: passive, active and service. These correspond to the physical assets (eg fibre), the electronic protocols that transport data (eg Ethernet), and the services that are offered to end users (eg broadband). A fully-integrated provider like Virgin Media owns and operates all three layers. A wholesale provider like Openreach owns and operates the bottom two (passive and active), with competing providers (ISPs) offering the services. Some networks (eg Amsterdam Citynet) have a separately owned passive layer with one or more active operators and multiple ISPs. These are favoured by authorities such as the European Commission because they promote greater competition.

The cooperative neutral host is mostly a contracting body, constituted as a mutual to guarantee neutrality. It charges operators access fees and pays asset owners rent. It also makes arrangements for fibre maintenance.

Publicly owned asset sharing can be mediated using a cooperative neutral host using the ‘Thin Layer’ (Tameside) Model. Governance of any new network constructed on this basis can follow two routes:

- Join Cooperative Network Infrastructure (CNI), the existing cooperative created in Tameside and now operating in Blackpool.
- Create one or more local, independent cooperative neutral hosts, which then can then offer access to ISPs locally and through CNI.

In either case cooperative neutral host members will be drawn from public and private sector and will be open to any public sector institution or private sector business meeting minimum criteria for trade. They will include:

¹¹ Specifically, local ‘access network’ and ‘backhaul’ connections back to a major point of presence

¹² Specifically, ‘carrier-neutral’, not dependent on or owned by any single carrier or service provider

¹³ Including Blackpool and Bournemouth

- owners of physical assets, including duct and co-location space, providing access to these assets to the cooperative neutral host for a commercial fee. As well as the LEP, local authorities and the universities, this may include other local authority and public-sector institutions, and private-sector property owners;
- investors, including public sector institutions and property owners interested in connecting properties. Investors will receive an attractive commercial rate of interest; and
- wholesale users, including public sector IT departments that want direct access to dark fibre, service providers to the public sector (e.g. WAN providers), wholesale and retail ISPs and carriers, high-end digital and technically capable businesses that operate their own dark fibre. Users will pay commercial rates set by the cooperative neutral host to access dark fibre.

Newly constructed ducting created by public sector investors will be rented to the cooperative neutral host at commercial rates.

Parallel acceleration mechanisms

Two additional mechanisms can exploit the cooperative neutral host to commercialise access:

- An aggregated end-user investment ('crowdfunding') vehicle can finance and own physical duct assets which will be made available to the cooperative neutral host (and hence cooperative neutral host members) at commercial rates. This may include ducting in business parks, villages and suburban areas. The mechanism will share some characteristics with the highly-successful B4RN cooperative and the Openreach Community Fibre Partnership scheme. Gigabit voucher funding will be usable with this mechanism. Residential investors will be able to claim SEIS relief.
- A dig once stewardship mechanism will manage new duct installation as part of the dig-once programme. This may include duct installed in new-build commercial and residential developments, road upgrades, new cycle ways, transport infrastructure, such as bus corridors. A potential form is a trust constituted as part of the public sector. Such a trust would have an income which could be used to part fund or compensate for the (small) costs of dig once duct installation.

Market engagement

Local authorities across Coast to Capital already invest in open access digital infrastructure. There are several existing 'spine' projects which would need to be 'joined up' in the design of a wider regional vision and subjected to market testing to understand how it could be commercialised. If those market tests have a positive outcome, network operators and providers will be able to engage with the cooperative neutral host in a number of ways as follows:

- Obtaining dark fibre and active products from cooperative neutral host members.
- Joining the cooperative neutral host and gaining access to dark fibre products, made available to all members at equitable rates.
- Constructing their own duct assets and making these available to cooperative neutral host to populate with fibre for a fee. They may install their own fibre in these assets.
- Constructing their own duct assets and connecting these to the cooperative neutral host network without making them available to other members.

Neutral host operator

There are two options for establishing the cooperative neutral host:

- Engage with the existing cooperative neutral host operating in other areas
- Establish a new cooperative neutral host

Engage with the existing cooperative neutral host

The existing cooperative neutral host is Cooperative Network Infrastructure (CNI)¹⁴. Using CNI as the cooperative neutral host for all new public investment in fibre across Coast to Capital LEP area has advantages:

- There is no need to spend time or effort setting up a (or more than one) local body
- Demand from the existing group of ISP and telecoms operator members of CNI is easily channelled to the Coast to Capital area (although this is also possible with a new cooperative neutral host - see below)
- A ready-made set of products, prices and standards is ready to apply.

These advantages need to be balanced against some disadvantages:

- There is less scope to adapt the products and prices to suit the particular circumstances in the Coast to Capital area
- A local cooperative neutral host may be viewed more positively by potential partners, either from a political or economic perspective

At July 2019, CNI has 21 members, including eight public sector bodies and 13 telecoms operators or service providers. Among these are national providers including:

- Virgin Media Ltd
- ITS Technology Group
- TNP
- Telcom
- Concept Solutions People

Currently CNI has two local authority members (Tameside MBC and Blackpool Council). Applications are anticipated shortly from Manchester City Council and Mid Sussex District Council.

CNI is committed to extending the cooperative neutral host model. It is likely that it would welcome the opportunity to extend its operations to Coast to Capital assuming that a business case can be made. Key elements of the business case would be:

- What duct assets could be made available to CNI: for example, this could include space in newly constructed duct in the regional spine.
- Whether these would be available at a suitable rate: CNI normally pays 60p/m per year.

¹⁴ <https://cni.coop> - this was formerly the Tameside Digital Infrastructure Cooperative

- What colocation space could be made available and whether this would be at a suitable rate. CNI currently pays £500/month for a rack footprint in a fully-equipped data room. Example colocation facilities to enable CNI to make use of the regional spine would be in the Digital Exchange in Coast to Capital and in DX-PoPs across the region.
- Which bodies would be in a position to provide CNI with access to these assets. This would likely include Coast to Capital but also others, such as universities.

The process to join CNI would mean:

- Finding answers to these questions
- Discussions with CNI officers leading to in principle agreement
- Governance as required
- Complete an application form and pay £1 share capital
- CNI members approve new membership

Establish a new cooperative neutral host

An independently-created Coast to Capital cooperative neutral host – or individual coops based on local authority areas - would have advantages:

- It could create its own products, specifications and prices;
- It would be better able to attract local ISPs and telecoms operators as well as national;
- It could present itself as being by and for the business and citizen communities in the immediate locality or wider region.
- These advantages need to be balanced against the extra complication involved:
- The need to set up a local body and attract members;
- The likelihood that national operators will not want to join multiple cooperative neutral hosts.

However, Cooperative Network Infrastructure has designed a structure to enable local areas to create separate neutral host vehicles and still benefit from the aggregated demand that CNI members can supply.

This is summarised in the schematic below.

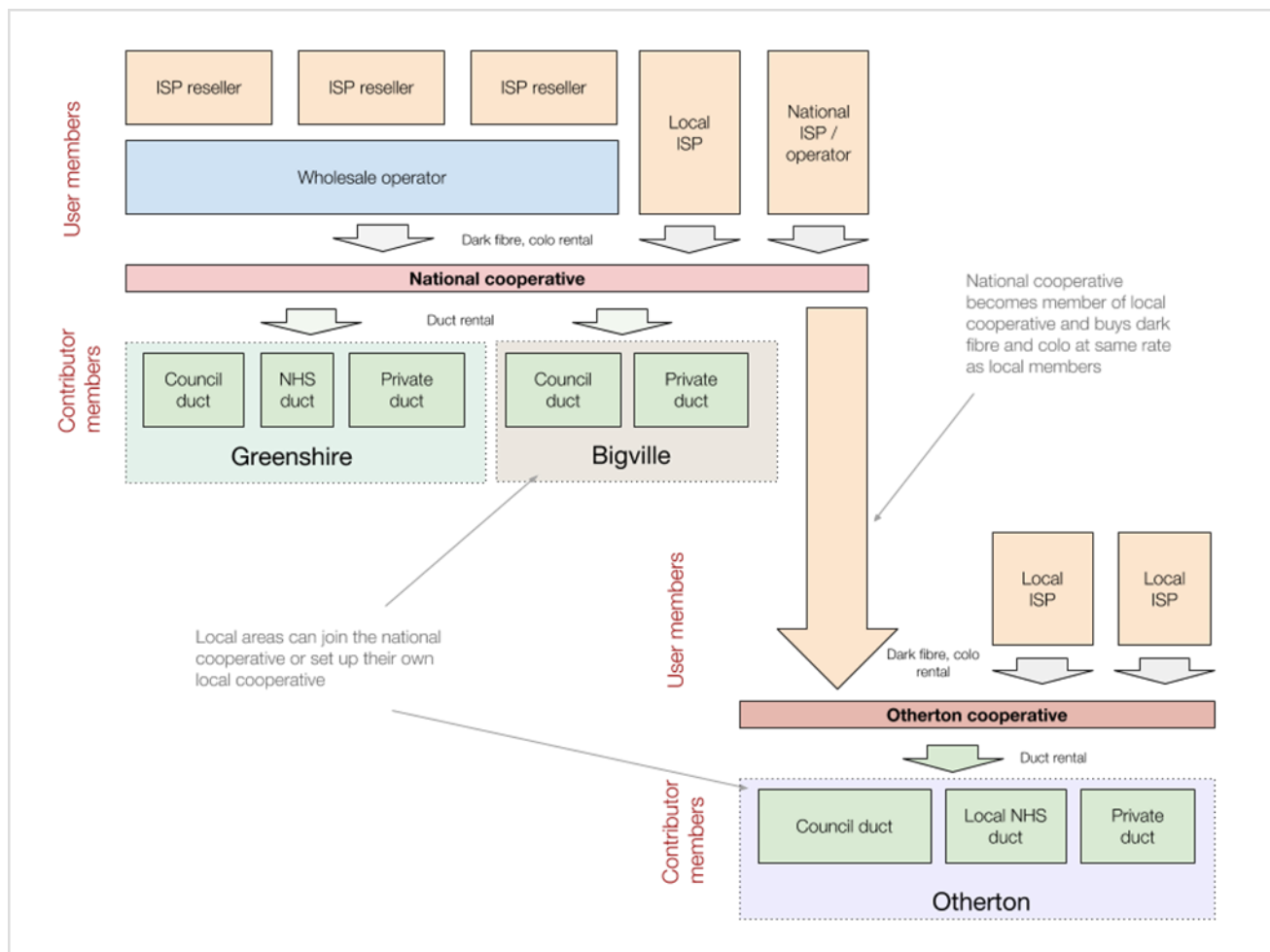
In this diagram, Coast to Capital LEP and its local authority partners can either play the role of Bigville (joining CNI), or Otherton (creating a new cooperative neutral host). This arrangement:

- Reduces but does not eliminate the extra complication of creating a new cooperative neutral host. The close relationship with CNI allows product specifications and prices to be re-used, while leaving some flexibility for specialised local adaptations.
- Retains the potential for CNI members such as Virgin Media to access infrastructure in the Coast to Capital region, while also potentially offering a lower resistance engagement for local ISPs. This requires however that the local cooperative neutral host is able to offer products (dark fibre etc) that conform to CNI minimum specifications and service levels and that are priced on or below the wholesale rates set by CNI.

In order to set up a local cooperative neutral host, the following steps would be required:

- Establish what assets could be made available.
- Design products and specifications, taking account of the wholesale requirements of CNI.
- Design rules of local cooperative neutral host.
- Engagement with local ISPs and public sector partners to act as founders.
- Governance as required.
- Incorporation.
- Invite CNI to join.

Figure 6. Options for local structures to benefit from demand aggregation by Cooperative Network Infrastructure



Procurement and State aid

The initial intervention will not involve the provision of state aid.

Public funds will be used to create the spine duct network and populate it with fibre for public sector use. This will support the provision of services for the public sector to enable service transformation and cost savings. The core duct will be owned by the investing (public) bodies.

As set out above, in addition to meeting the public sector needs, once developed, the duct network will have significant spare capacity which can be made available to the cooperative neutral host along with space in the Digital Exchange and DX-PoPs.

In accordance with the state aid advice on the thin layer model from PwC and others, this will be charged for at a commercial fee. To ensure that LFX operates in accordance with the Market Economy Operator Principle, any such transactions will be priced in line with the rates prevailing in the market at the relevant time.

The existing cooperative neutral host, CNI, has non-onerous membership criteria to ensure that it is open to all network operators and providers, and conducts all its operations on a sustainable, commercial basis. The same characteristics would be shared by a local body if used.

These interactions with the cooperative neutral host will ensure compliance with the Market Economy Operator Principle (MEOP) and therefore will not constitute state aid.

MEOP (Market Economy Operator Principle)

MEOP – Market Economy Operator Principle – can be used to deliver legitimate State aid to undertakings in which the public sector invests to meet its own objectives whilst offering no advantage to any single commercial operator. It is the basis of State aid assurance for all DCMS-approved PSAR projects.

MEIP (Market Economy Investor Principle) alternative

Some local authorities have rejected the cooperative neutral host (or ‘thin layer’) model as not offering a sufficient return on investment – although this is countered by Mid Sussex District Council’s modelling which shows a return on investment on shared ‘spine’ or ‘scaffold’ network of 6.5% - 6.9%, which is better than if they bought another kind of capital asset. There is independent evidence for the ratchet effect of this on investment on land values, economic development, wider economic impact and other forms of investment - not just ROI, but a development case.¹⁵

However, to address these concerns directly, there is also an option for public funds to be invested in the cooperative neutral host for a commercial rate of return, on a Market Economy Investor Principle basis. In this case the cooperative neutral host would own the assets so created.

A public sector body using this route would see a higher rate of return compared with public ownership of the duct assets.

The thin layer model is able to accommodate both MEOP and MEIP routes simultaneously.

¹⁵ Regeneris (2018): The Economic Impact of Full Fibre Infrastructure in 100 UK Towns and Cities <https://www.cityfibre.com/wp-content/uploads/2018/03/The-Economic-Impact-of-Full-Fibre-Infrastructure-in-100-UK-Towns-and-Cities-12.03.18.pdf>

7. Economic Impact

This section takes a selection of the existing and planned interventions referred to at section 2, above, and considers the economic impact of a 'mixed economy model' enabled by a digital spine infrastructure.

7.1 Mechanisms

The stakeholder consultations indicate a range of mechanisms being adopted across the Coast to Capital area in improving access to full fibre infrastructure. There will be a mixture of publicly owned fibre networks, the implementation of the Public Sector Anchor Tenancy model with private sector partners and the adoption of collaborative/cooperative models in some projects. There is also the extent to which Coast to Capital can influence National Rail's approach to adding digital capacity to the Brighton Mainline. Some areas have won funding from the government's LFFN (Local Full Fibre Network).

There are strategic opportunities identified by stakeholders in the potential to share spare capacity in public networks with the private sector as well as other public sector partners. This would have transformative effects on the growing digital and technical sectors, on the wider economy, and on public services. There is also some potential to earn revenue.

Infrastructure sharing would enhance the range of options available to Internet and telecoms providers looking to provide better services, generally by making an additional investment to reach business and residential customers. In such cases it is possible to support a private-sector business case, combining access to publicly owned dark fibre and potentially using government Gigabit vouchers to connect users. This approach will be increasingly important in making sure that rural areas are able to receive full fibre services and access to fibre is important to the delivery of 5G services.

Public sector already gains benefits that come from having own infrastructure. These benefits include cost savings compared with buying connectivity services from commercial operators, and improved efficiency and opportunity to innovate with service delivery through cost-efficient access to high bandwidth.

7.2 Types of benefit and impact

The following are possible outcomes and additional benefits that the public sector may expect as a result of sharing infrastructure.

Direct outcomes

- Opportunities for other public sector bodies (for example NHS) also to use the network to deploy new or improved services, or save costs
- Investment by public or private sector, taking advantage of the opportunity to deploy new fibre connections and access networks for less cost (by using the access to publicly shared networks as 'backhaul'). This inward investment will provide local opportunities for construction work and related employment
- New opportunities for digital, tech and creative businesses to innovate, differentiate and add value in the production and delivery of digital services, with consequent employment and learning opportunities for citizens

- Improved productivity in the wider business sector due to improved connectivity and access to digital services (for example in the important logistics and aviation sector), leading to economic growth with consequent employment and learning opportunities for citizens
- Direct revenues received from private sector users paying to access the infrastructure.

Secondary and network effects

- Growth in digital and wider sector businesses will lead to increased demand for connectivity, which in turn will accelerate investment in the network
- New investment in the network - either public or private - will extend its reach and usability and so accelerate the other benefits

These secondary effects form a virtuous circle, magnifying and accelerating the impact.

Some outcomes have more potential to produce secondary and network effects than others. The table below ranks the outcomes in this order.

Figure 7. Direct, secondary and network effects of investment in digital infrastructure

Outcome	Direct impact	Second order result	Leads to	Leads to
Opportunities for digital and tech	Economic growth and skilled employment	Increased demand for connectivity	New investment	All other outcomes
Improved productivity in wider business sector	Economic growth and employment	Increased demand for connectivity	New investment	All other outcomes
Investment by private or public sector	Network construction opportunities	Bigger network	All other outcomes	
Opportunities for other public sector bodies	Cost savings and service improvements			
Direct revenue for public sector	Improved services or lower council tax			

This suggests that the outcomes that impact the digital, tech sector and wider business sectors will be much more significant than other benefits. It therefore makes sense to prioritise these outcomes when assessing ways of sharing.

7.3 Economic impact assessment

The stakeholder consultations provided indications of the approaches being adopted across the Coast to Capital area though, at this stage, we do not have access to specific data on individual projects to enable us to model economic impact; many of the proposed projects are at an early stage of development where data are not yet available.

As an illustration of the types of economic impact which can be achieved by digital infrastructure projects of the type being considered by Coast to Capital, we use a 'proxy' model using metrics benchmarked on evidence and experience from previous projects combined with ONS data. The

approach to this proxy model is to define a 'notional' local authority based on consideration of existing strategies and approaches combined with ONS data to calculate impact.

7.4 Business population in the Coast to Capital area

Figure 8 sets out the population of businesses in the Coast to Capital area:

Figure 8. Population of businesses in the Coast to Capital area

Local Authority	SMEs	Big Business (+250)	All Businesses	%SME
Surrey				
Epsom and Ewell	4,195	10	4,205	99.76%
Mole Valley	6,015	20	6,035	99.67%
Reigate and Banstead	8,050	30	8,080	99.63%
Tandridge	5,420	5	5,425	99.91%
West Sussex				
Adur	2,680	5	2,685	99.81%
Arun	6,200	15	6,215	99.76%
Chichester	7,615	20	7,635	99.74%
Crawley	4,570	50	4,620	98.92%
Horsham	8,290	20	8,310	99.76%
Mid Sussex	8,230	20	8,250	99.76%
Worthing	4,505	20	4,525	99.56%
Strategic partners				
Croydon	16,570	45	16,615	99.73%
Lewes	5,025	10	5,035	99.80%
Unitary authority				
Brighton and Hove	16,140	60	16,200	99.63%
Totals	103,505	330	103,835	99.68%

‘Notional’ local authority

A ‘notional’ local authority allows us to produce a high-level model of impact. We have used it here, as we have done in other regions, to overcome discrepancies between the economic data available between local authorities.

In defining the ‘notional’ local authority we have chosen to use the average of Crawley and Horsham as the input assumptions on business populations for the model:

Figure 9. Notional local authority model

Notional LA model	SMEs	Big Business (+250)
Crawley and Horsham Averaged	6,430	35
Average (excluding Croydon and Brighton and Hove)	5,900	19
Average for all Local Authorities including strategic partners	7,393	24

In order to model the business impacts on SMEs, we have chosen to use the GVA per filled job as the average for Surrey, East and West Sussex and show this in the table below together with the other GVA statistics available from the ONS:

Figure 10. GVA per filled job, 2017

GVA per filled job 2017	£
Croydon	57,311
Surrey, East and West Sussex	56,509
Brighton and Hove	48,934
East Sussex CC	47,427
West Surrey	64,278
East Surrey	65,127
West Sussex (South West)	50,680
West Sussex (North East)	53,893
Source: ONS Nominal (smoothed) GVA (B) per filled job (£); NUTS 2 and NUTS 3 subregions, 2017	

7.5 Innovation and productivity gains

In this section, we show the summary outputs of the impact model and then provide the underpinning logic and assumptions.

Figure 11. Innovation and productivity gains

Benefits: GVA increases	NPV - 10 yrs.	NPV - 15 yrs.
Existing SMEs close to network	20,558,087	22,226,793
Startups close to network	8,765,537	9,477,038
DX Impact High Growth Digital/Creative SMEs	15,245,298	15,245,298
Total GVA uplift	44,568,922	46,949,129
Benefits: cost savings		
Cost savings to existing leased line users	1,488,625	2,564,375
Total benefits	46,057,547	49,513,504
Project costs		
Local spine network	4,297,320	4,297,320
Voucher scheme	162,381	191,166
Total costs	4,459,701	4,488,486
Balance		
Benefits less costs	41,597,846	45,025,018
<i>Leverage (%)</i>	9.33	10.03

Modelling approach

In order to build the economic case for the Coast to Capital Notional LA, we need to understand the quantitative and qualitative benefits available. To do this for benefits that can be quantified at this stage, we have developed an economic model for each element of the project defined according to the classes and type of benefits available to various stakeholders. At this stage, we have focused on a small class of quantifiable benefits. We note that there are qualitative benefits that are not considered in this model.

In this case for the Notional authority, we construct “proxy” metrics to calculate the impacts; where proxy metrics are not available, we have used experience of recent projects and expert judgement with supporting logic to make informed estimates. We note that:

- All evidence and estimates are documented as part of the modelling process.
- The nature, scale and extent of modelling is necessarily high level and undertaken in accord with the following modelling principles:
 - Reasonableness – of assumptions
 - Erring on the side of caution
 - Proportionate in terms of the level of detail for the calculations given the high-level nature of the analysis, the availability of data and of modelling time/resource
 - Keeping the model as simple as possible through using a modular approach.

To form the economic model, we identify classes of benefit and then build evidence-based cost benefit analyses to calculate the financial impacts over time. Once we have this, we can derive the Net Present Value (“NPV”) of each module. The sum of the NPVs across all the modules is then the overall impact of the project. The assumptions for each module regarding costs and benefits are explicitly stated. The assumptions are therefore both challengeable and changeable based on fresh evidence and data as they emerge.

Innovation and productivity gains

The economic impact model estimates the potential gains to businesses in terms of:

- Improved productivity.
- Reduced costs.
- Increased levels of product/service innovation.

The input metrics used for the benefits are evidence from the Greater Exeter Digital Connectivity study for East Devon District Council based on a survey by Adroit Economics of 202 SMEs produced in January 2018¹⁶.

Adroit used the views of their survey respondents to calculate the direct impact on businesses of their digital connectivity - looking at the potential for new products and services to increase sales, and for time-saving benefits to enable existing staff to be more productive. This is a very valuable approach as it enables the model to reflect the potential value of the innovative effects of adoption of digital technologies and to model the GVA impacts of more profitable firms (increased sales and

¹⁶ Greater Exeter Digital Connectivity Study, Adroit Economics, January 2018

reduced costs). Adroit also noted that the smaller the firm (in terms of turnover), the greater the impact.

We note that Adroit's approach using this methodology to represent to total economic benefit to firms was the method agreed as reasonable with the Greater London Authority (GLA) economics team when Adroit evaluated the GLA's SME broadband survey.

It is also the case that survey respondents are generally 'self-selecting'; and that those who have achieved success from their digital connectivity (or for example are 'early adopters') are therefore more likely to participate in surveys; possibly risking skewing the results towards 'success cases'. It is also problematic in that applying the benefits experienced by a small number of cases to all SMEs in a region risks 'over-claiming' the results of an intervention. Our methodology is designed to account for these risks and eliminate 'optimism bias'; we consider this further below.

In our model, we identify the benefits available to a subset of SMEs for the Coast to Capital notional authority area covered by the network as follows:

- Total number of SMEs.
- Identify the number of SMEs close to and passed by the network.
- Assume that we have an 'addressable' market of 30% of these SMEs.
- Assume that only 10% (of the addressable market) agrees to take up services.

In this way, we are using the data from Adroit which applies to the number of SMEs they surveyed (which may be self-selecting) to the numbers of businesses we calculate are likely to experience similar benefits.

7.6 Network Design and Economically Addressable Location Assumptions

Modelling business impacts

We consider three classes of benefit for this model:

- SMEs and start ups
 - Existing SMEs close to the network
 - Start-ups close to the network.
- SMEs and start-ups located in the Notional Local Authority's Digital Exchange.
- Large businesses that achieve cost savings by connecting to the network.

For each of the Benefit categories, we have built a 'module' of the economic model where the benefits in terms of GVA uplift are calculated based on a set of carefully defined assumptions. In this section, we provide an overview of the assumptions and the model outputs. Each output is the NPV of the benefits calculated over a 10-year period (plus or minus 20%). In the economic model, we also calculate the NPV over 15 and 25 years. A major benefit of this type of investment in infrastructure is the potential to support and encourage growth by SMEs, both in terms of existing SMEs and encouraging start-ups.

SME economic impacts – input assumptions

In the model, the inputs used are adjusted to calculate the attributable impacts allowing for deadweight, displacement and leakage and industry standard multipliers.

In modelling the benefits to SMEs, we have taken a cautious approach and assumed that the GVA per employee is the average for Surrey, East and West Sussex based on ONS data. In fact, we know that digital/tech SMEs have significantly higher GVA per employee and that these SMEs are capable of higher growth rates than average, both in terms of sales and employee growth.

Figure 12. SME economic impacts – input assumptions

Metric	Value	Notes
GVA per FTE	£56,509	ONS Regional and Sub regional Productivity February 2019 release
Greater productivity and innovation		
Additional sales	£32,897 per FTE	A proxy metric based on Adroit Economics research in Greater Exeter
Productivity gains	£94,335 per FTE	A proxy metric based on Adroit Economics research in Greater Exeter
GVA to sales ratio	50%	Widely accepted metric to convert sales increases to GVA uplifts.
Average FTE per SME	2.88	BEIS Business Population Estimates for the UK
Coast to Capital start up rate	10%	Assumption based ONS data re new starts in Coast to Capital area; rate based on existing SME population

SME addressable market and take-up assumptions

The estimate of the number of businesses ‘passed’ follows the convention used by DCMS, which regards locations within 50m of a network as ‘passed’ and those within 200m as ‘accessible’.

Figure 13. SME addressable market and take-up assumptions

SME type	Total number	Addressable market (“AM”)	Market take-up	Notes
Total number of SMEs within 50m of network	741	222 (30%)	22 (10% of AM)	Based on network topology planning models
SMEs 50-200m from network	2,008	1,029 (15%)	103 (10% of AM)	Addressable market excludes start ups
New starts <50m excl DX 50-200m	201	207	62 (30% of AM)	GVA per new start

DX Impact – high growth Digital/Creative SMEs

We have also modelled the impact of a Digital Exchange (DX) in helping to develop a cluster of Digital/Tech SMEs. In modelling the impact of the DX, we have also taken a cautious approach noting that the DX in Brighton has 90 SMEs directly connected to it. We have also assumed (in line with Treasury Green Book best practice) a gradual build-up of SMEs participating over 5 years followed by an impact ‘tail off’ reflecting possibility that the impact of an intervention diminishes over time.

Figure 14. DX impact on the number of high growth Digital/Creative SMEs

SME type	Number	Market take-up
Existing SMEs who become tenants of the DX	50	45 (60%)
Start-ups allocated with the DX	5	5 (100%)

Big company connection savings

We have modelled the potential benefits to big companies (>250 employees) of connection to the Coast to Capital network.

Data from Ofcom¹⁷ shows the level of spend of by large companies and also how many companies typically have dark fibre connections. We use these inputs to identify an addressable market of large companies. We assume that a proportion of these companies in the area will transition to the network over a five-year period.

Figure 15. 'Big company' assumptions

'Big Company' Assumptions	Total number	Addressable market ("AM")	Market take-up	Notes
Big Company population	35			Source: ONS data
Big companies within 200m of network	17	17	5 (30%)	Total number is based on proportion of companies close to network (48% of big companies) and Ofcom stats on corporate dark fibre users (17%)

Figure 16. 'Big company' savings

'Big Company' Savings	Cost	Notes
Existing Annual Spend on Connectivity	£52,000	Ofcom 2016 - costs of corporate connectivity. We assume one site in Coast to Capital area
Set up cost (one off) new fibre	£25,000	150m dig plus 2 optical routers
Annualised Running costs new fibre	£8,970	Based on TDIC price list and typical ISP operating costs

¹⁷ Ofcom's Business Connectivity Market Review, 2016

8. Recommendations

8.1 Prioritise investment in open access fibre digital 'spine' networks

The combination of methods and criteria outlined in this report can be used to build up a comprehensive shared infrastructure over time, piece-by-piece as investment opportunities become available. However, in order to kick-start the process it makes sense to ensure that there is a scaffolding to support increased speed of deployment and to maximise the availability of early investment opportunities. So for example, barriers to investment in new local 'access' networks are reduced if the 'backhaul' connections and exchange point to connect back to the Internet are already in place.

Previous government strategy relied on subsidising incumbent operators to fill gaps in existing network infrastructure. However, this failed to address the path dependencies, described in Section 3, that have had a particularly negative impact on the development of digital network capability in rural and coastal areas, and smaller towns.

Neutral spine infrastructure

A shared open-access regional spine ('scaffold') fibre network, spanning the LEP region utilising diverse suppliers, connected by a number of DX with 'DX-PoP' access points would help to overcome these barriers; and it would support the business case for investment in new 'access' networks and local spine networks.

The spine can be assembled by aggregating assets based on a range of investment cases in a 'mixed economy' model; from dig-once duct, through collaboration with private investors in trench and duct sharing, by capitalising public sector revenue costs over a period to save costs through owned infrastructure and by investing in exchange for a share of revenue from the cooperative neutral host.

The regional spine, as well as supporting the creation of local spine and access networks can also support direct connections with tails to buildings that lie close to its route. This direct benefit can be maximised with careful routing of the spine; and can be designed to support key sectors across the region.

The regional spine network can be used by ISPs and telecoms operators to "PoP" the Fibre Exchanges, so reducing Internet transit costs in those locations.

8.2 Coast to Capital to lead on the establishment of a dig once stewardship mechanism

We recommend that Coast to Capital works with local authority partners to establish a stewardship body to administer 'dig once' policies for the creation and accretion of new duct for fibre across the region. Dig once stewardship mechanisms have been used successfully in the US, and now in some UK cities, to deploy fibre-duct infrastructure at minimal cost. They do this by addressing opportunities to install ducting for fibre at very low cost when digging is already taking place; for example, when developers construct new housing or business developments, or when local authorities build new roads, upgrade, or create bus corridors. Duct could also be installed when utilities companies dig up the roads to upgrade or deploy other infrastructure.

The stewardship body would be set up to take ownership of the growing duct network created through a regional dig-once policy and other public sector interventions. But it could, depending on its governance structure and agreement of partners, have a wider advisory and operational role to lead the infrastructure strategy and coordinate the efforts of multiple stakeholders.

Such a body could take different legal forms, for example a public sector partnership overseen by a statutory committee or board, a joint-venture company, Community Benefit Society, or an arms-length trust; details of governance options are discussed in more detail at 6.1, above.

8.3 Create or engage a cooperative neutral host

We recommend market testing be carried out to establish the viability of the cooperative neutral host model in the Coast to Capital region prior to its adoption as the preferred model for opening access to shared duct assets. This has many benefits including proven success in other areas in attracting engagement from private sector operators.

The cooperative neutral host would mediate access to contributed assets, including but not limited to those owned by Coast to Capital partners including the LEP, local authorities, universities and other public sector bodies. It would take the form of a cooperative society.

There is an option either to engage with the existing cooperative neutral host now operating nationally: Cooperative Network Infrastructure (CNI), originally set up by Tameside MBC and now involving other local authorities; or to create a new one. In general it would be simpler to join the existing body, but there may be some advantages in creating a local body, which may or may not outweigh the additional complication. We make no specific recommendation on this matter.

With either option, by offering a set of products (for example, dark fibre) that meet the criteria and maximum prices set by CNI, access can be provided to the telecoms operators and ISPs that are already members of CNI. These include national operators such as Virgin Media Ltd.

8.4 Create a mechanism to support aggregated user investment

We recommend establishing a mechanism to facilitate the aggregation of end user funds (crowd funding) to finance new duct and fibre build across the Coast to Capital region. This could be through creation of a new body such as a Community Benefit Society, able to issue shares accredited through the community shares scheme, or by working in partnership with an existing body such as B4RN or Cooperative Network Infrastructure.

8.5 A sandbox for application of digital technology across the economy

Consistent with the aim of developing a distinctive local industrial strategy to leverage Coast to Capital's diversity in sector and density, the region could benefit from a 'sandbox' for applications of transformational digital infrastructure in other industry sectors – environments for collaborative research and development that give businesses from all sectors access to the knowledge base within local universities and the private digital-tech sector.

During the course of the consultation, university partners were also at pains to stress the importance of extending opportunities for this type of collaboration not just to start up (or even scale up) businesses within the digital tech sector; but to large companies in other high productivity sectors (such as advanced manufacturing and professional and financial services) that could address the concerns about a growth and productivity gap emerging between Coast to Capital and other regions.

This 'sandbox' could benefit from enhanced connectivity by being delivered in diverse locations – urban, semi-rural, rural and coastal – across the region, potentially connected to development of DX and DX-PoP locations.

