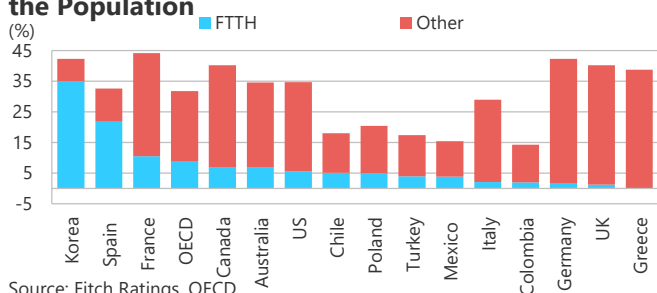


Global Development of High-Speed Broadband Infrastructure

Considerations for Investors and Fitch’s Approach to Broadband Infrastructure

Fibre-to-the-Home Connections as a Percentage of the Population



Source: Fitch Ratings, OECD

The demand for a reliable and fast broadband connection is increasing as the internet becomes more essential to both households and businesses.

Governments worldwide are responding to the need for a fast and reliable internet connection with funding and support to ensure rural or economically weaker areas are not left behind. The proportion of high-speed, fibre-to-the-home, broadband, connections among areas of the OECD still varies significantly, however, as shown in the graph to the left.

The coronavirus crisis has further highlighted the importance of fast internet access, as working patterns and access to services change. Fitch Ratings views broadband access as increasingly essential to society, akin to utilities such as water and electricity. Fitch expects fibre broadband demand to continue increasing.

Related Research

[Alternative Infrastructure Assets \(June 2019\)](#)

[Coronavirus Proves US Broadband Infrastructure Is Essential \(May 2020\)](#)

[Fitch Affirms Kentucky Wired Infrastructure Co.'s Senior Revs at 'BBB+'; Removed from Negative Watch \(March 2019\)](#)

[Fitch Affirms Red Dorsal Finance 2015-1 Variable Funding Notes at 'BBBsf'; Outlook Stable \(February 2020\)](#)

Analysts



Matthew Chaplin
+44 20 3530 1851
matthew.chaplin@fitchratings.com



Radim Radkovsky
+44 20 3530 1254
radim.radkovsky@fitchratings.com



Mark Lazarus
+1 312 368 3219
mark.lazarus@fitchratings.com



Danilo Quattromani
+ 39 02 879087 275
danilo.quattromani@fitchratings.com



Glauca Calp
+57 1 484 6778
glauca.calp@fitchratings.com



Sajal Kishore
+65 6796 7095
sajal.kishore@fitchratings.com

Governments Support Private Investment

Many countries are employing public-private-partnership (PPP)-like schemes to incentivise private investment in broadband infrastructure, particularly for rural areas, while private investors may also find opportunities to employ ring-fenced special-purpose vehicle (SPV) structures to invest in broadband networks.

Rural Fibre-to-the-Home Is Challenging

Fibre-to-the-home (FTTH) is the dominant technology delivering high-speed broadband. It involves fibre optic cables that go directly to homes and premises – in rural areas this is challenging and expensive due to the increased distances covered.

Installation can be un-economical without government support and governments are therefore focusing on supporting FTTH to ensure areas are not left behind.

Understanding Demand Exposure Is Crucial

Fitch considers it critical for investors to understand the demand exposure of any broadband project’s revenue and the credit quality of revenue counterparties’ obligations to assess the risk exposure. Transaction structures may vary – some are project-financed and others are funded on government or corporate balance sheets.

Revenue frameworks for broadband PPPs are still evolving and project exposure to operational and demand risk vary significantly.

Alternative Infrastructure Approach

Fitch will approach the analysis of ring-fenced broadband infrastructure projects using its alternative infrastructure approach, based upon the [Infrastructure and Project Finance Rating Criteria](#), with elements incorporated from sector criteria such as the [Availability-Based Projects Rating Criteria](#), depending upon the transaction’s revenue structure.

Demand for Data Has Increased Significantly

Data consumed across the world has been fast increasing as services move online and internet access widens, with at least 50% of the world now having access to the internet. In developed economies this has led to a rapid growth in data consumption – as in the UK where fixed-line data usage has increased to 315 gigabytes (GB) a month in 2019 from 50GB a month in 2013, a six-fold increase in data usage. The 2019 figure is equivalent to 3–4 hours of high-definition video content streaming a day.

This increase in data usage has a strong correlation to the uptake of high-speed broadband – showing that households with high-speed broadband increase their data consumption and use of online services. Governments are aware of this and are beginning to introduce regulations to ensure the widespread roll out of high-speed internet access.

The penetration of fixed broadband subscriptions remains relatively low in Asia-Pacific, although it has been growing at a faster rate than the global average for the past few years. Asia-Pacific is also growing at a faster rate than other regions in terms of mobile cellular subscriptions per 100 inhabitants. This highlights the improving quality of Asia-Pacific infrastructure and the growing demand for high-speed fixed broadband connections in Asia-Pacific.

Despite the growing need to expand fast broadband connection – especially to rural areas – most countries in Latin America haven't announced centralised plans to incentivise the roll-out of high-speed broadband. Most of the significant investments have been made by private sector companies, although the public sector is beginning to become involved to ensure rural areas also receive internet access.

Governments Aim for Nationwide High-Speed Broadband

Governments and state institutions across the world have been supporting the roll out of high-speed broadband, particularly in rural or less developed areas. Social benefits include economic growth, increased business competitiveness and innovation, the delivery of better-quality and more-efficient public services, and the delivery of other social or economic development objectives. Much of this support has been through the development of non-binding targets that guide policy.

In 2016 the EU launched a strategy to create a European 'Gigabit' society with the following main strategic objectives:

1. Access to 1 gigabit per second (Gbps) for all schools, transport hubs, main providers of public services and digitally intensive enterprises.
2. Access to download speeds of at least 100Mbps with the potential to be upgraded to 1Gbps for all European households
3. Uninterrupted 5G wireless broadband coverage for all urban areas and major roads and railways.

At the national level, the UK has established similar targets to supply gigabit broadband for all by 2025. Sweden has more detailed

targets defined in its broadband strategy, which aim for 98% of all households to have access to 1Gbps broadband by 2025, and for the entirety of Sweden to have reliable high-quality mobile services no later than 2023. Meanwhile, the US adopted a similar target in the 2010 Federal Communications Commission-led National Broadband Plan – the 10-year goal of which was to roll out broadband of at least 100Mbps to over 100 million Americans.

The government-level targets are intended to be mostly met by private sector investment, with specific public sector support where required. There are several mechanisms in place to incentivise this investment and to directly provide public investment to meet these ambitious targets. This is particularly true in rural areas where private investment is seen as less economically viable.

Many Asia-Pacific countries have endorsed The Broadband Commission for Sustainable Development's – a joint initiative between the International Technology Union, a specialised agency of the UN, and the United Nations Educational, Scientific and Cultural Organization – targets to promote affordable internet access and increase broadband penetration. However, the economic diversity of Asia-Pacific countries presents sizeable challenges in the common development of communications infrastructure. Governments and regulators need to focus on investment to ensure a balance between profitability and equitable growth in less-developed regions or countries.

Various Technologies Can Deliver High-Speed Broadband

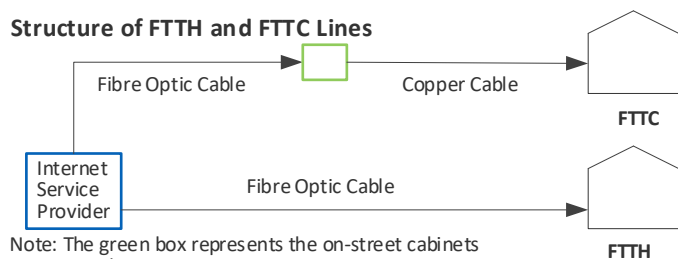
While there is a diverse range of technologies to deliver high-speed (over 100Mbps) broadband, fibre broadband stands out as an ultimate long-term solution for delivering data. Initially, fibre networks made up the backbone of national networks, but recent developments have led to fibre connections moving closer and closer to the end consumer.

Fibre-to-the-Home

The most reliable technology to deliver high-speed internet connection is fibre-to-the-home or fibre-to-the-premises (FTTH/FTTP), which delivers ultra-high-speed internet directly to business and households through fixed lines.

This new infrastructure builds upon the more common fibre-to-the-cabinet (FTTC) system, where copper cables are used for the final connection to home or premises from an on-street cabinet, by installing fibre optic cables directly to the home or premises. Speeds of up to 1000Mbps are possible with the FTTH approach – a vast improvement upon the previous theoretical maximum of around 80Mbps for FTTC. The final stretch of copper cable in FTTC removes the bottleneck from fixed-wire networks and eliminates the variability in realised speeds due to distance from the roadside cabinet.

Structure of FTTH and FTTC Lines



Note: The green box represents the on-street cabinets
Source: Fitch Ratings

The technology underpinning FTTC has been proven over the long term and FTTH develops on this – rather than being a revolutionary new technology. The difficulties with the technology come from the operational reality of installing fibre cables directly to premises and homes, and the massive variability in cost. Installation of fibre cables can be a challenging undertaking, especially in rural areas. BT estimates that, in the UK, it costs around GBP 4,000 per premises to install FTTP in the most difficult 10% of properties, compared with GBP300-400 in the easiest 50%. Fitch would look to a technical advisor to assess and give estimates to ensure cost budgeting is appropriate for a project.

5G-Fixed Wireless Access

A possible alternative to FTTH as a method of delivering ultra-fast internet connections is 5G-fixed wireless access (FWA). This alternative could be particularly useful in rural areas. Unlike fixed-line methods, 5G-FWA only requires the installation of broadcast mast infrastructure and the provision of a 5G-FWA-compatible broadband router. 5G-FWA can offer similar high upload and download speeds to fixed-line methods.

While this is a highly convenient way of installing high-speed internet connections, resulting in cost savings of ‘last-mile’ connectivity by as much as 40%, 5G-FWA is still in its infancy and involves political sensitivities on security and equipment providers. A possible drawback in rural areas is the dense networks of masts that may be required, potentially limiting it to densely populated areas.

Fitch views 5G-FWA as a possible competing method of delivering high-speed broadband for investors in broadband projects. Therefore, it will be important to understand its possible impact upon demand-exposed projects, especially in areas where it may be significantly more cost effective than installing ‘last-mile’ FTTH.

Broadband Delivery Technology Overview

	FTTC	FTTH	5G-FWA
Infrastructure	Fibre optic cables to street-side cabinet, copper cable to premises.	Fibre optic cables directly to homes.	Upgraded telecom infrastructure and connection device.
Theoretical maximum download speed (Mbps)	80	1,000	1,000+
Theoretical maximum upload speed (Mbps)	20	30+	500+

Source: Fitch Ratings

Global Perspectives and Solutions

To meet the government targets and expand high-speed broadband access many countries are employing PPPs specifically to ensure ultra-fast connections are available in rural areas that would otherwise not receive the private investment required.

Fitch believes that the collaboration with private sector through PPPs may aid fibre optic broadband roll-out in times of stretched government authorities’ budgets.

An important consideration in Fitch’s analysis of PPP-like deals is assessing the credit quality of payment counterparties – often public-sector grantors. Regularly, the concession grantor is the sole payment counterparty for the PPP and therefore the project’s credit quality could be constrained by the credit quality of the grantor’s obligation.

The allocation of risks in a PPP project can vary significantly. The public authority can fully take on demand risk in a pure availability-based concession model or act as an anchor tenant to limit the volume risk. Alternatively, the public sector can hold the design, build and operate (DBO) contract of the entire network while the private sector takes all revenue, operational, maintenance and lifecycle costs.

An example of a fully availability-based broadband PPP project rated by Fitch is Kentucky Wired Infrastructure Company (KY) (BBB+/Stable).

Various Projects Are Already in Place

A variety of models have been employed globally to roll-out high-speed internet connections. Each of these earlier projects provides learning opportunities and experiences for future broadband PPPs and infrastructure development.

Superfast Cornwall

Superfast Cornwall was launched in 2011 as a DBO grant-based PPP contract to deliver superfast internet to the predominantly underdeveloped and rural UK region of Cornwall. The project was grant-funded and investment, totalling GBP132 million, was predominantly split between the winning bidder, BT Group plc, and the European Regional Development Fund. The project mostly employed FTTC and the rural location led to specific difficulties due to the distance from roadside cabinets being too great to provide a superfast service. The project was deemed a success despite these difficulties and connected over 12,000 businesses to a fast internet connection before being extended twice to 2020.

French Broadband PPP Market Is Highly Developed

France has one of the most active broadband PPP markets in Europe, with several projects launched since the introduction of its broadband programme, Plan France Très Haut Débit, in 2013.

The EUR21 billion project has been reported to be behind schedule and EUR500 million further funding was pledged in early September 2020 as part of a stimulus package to offset the pandemic-related economic shock and to accelerate the rollout of high-speed broadband. Under the programme local authorities are authorised to create publicly owned broadband networks in areas where there has been limited private investment.

This is mostly done via a public service delegation, through which the local authority tenders the design, build, financing, maintenance and operations (DBFMO) to a private partner, typically for 25–35 years. In return, the private partner receives grant- funding or revenue support through an availability-based payment stream from the local authority. This support supplements revenue from private telecom companies who offer the product to the consumer and pay for use of the fibre network, leading investors to be exposed to demand and counterparty risk.

This demand exposure has led to some earlier projects struggling with competition from already-installed copper-based infrastructure. While slower than the PPP installed fibre infrastructure, some consumers have prioritised the cheaper offering if the service is at an acceptable speed for them. This highlights the importance of thorough due diligence and consideration of competitors for projects with demand exposure.

Greek PPPs Awarded

Greece launched its largest PPP initiative for the installation of ultra-fast internet connections to rural areas in 2019. Implementation will be through a DBFMO arrangement, in a similar fashion to the French model, and the project aims to provide broadband infrastructure to regions that cannot access broadband of 30Mbps.

The scheme is divided into three lots, each with two years assigned for building and a further 15-year period for operating the networks. Under the framework, the project SPV offers wholesale network access to internet service providers on a regulated price basis. Challenges of the projects include the sparse distribution of villages and permit issues, which could result in delays to the schedule.

Kentucky Wired Infrastructure Company

Affordable and reliable broadband service faces logistical and financial challenges for rural, commercial and residential customers. US states and municipalities are therefore examining alternative forms of financing and procuring high-speed internet services.

One such example of a state-wide approach is Kentucky Wired Infrastructure Company (KY). The Next Generation Kentucky Information Highway is a modern, primarily aerial, high-capacity fibre network within the state of Kentucky. Fibre optic cable will span 3,393 miles and is designed to connect 1,097 sites, including K12 schools, public universities and Commonwealth facilities, within Kentucky's 120 counties to high-speed, high-capacity broadband internet services.

All secured obligations have a security interest in the borrower's right, title, and interest in their assets (subject to exclusions), including the right to availability payments and other payments due under the project agreement. The medium-scale project benefits from a design-build joint venture of experienced contractors with a joint and several liability.

The project company faced difficulties getting attachment agreements and make ready construction completed in a timely manner with many existing pole owners throughout the state, leading to substantial delays beyond the original targeted completion of July 2018.

The system is now expected to be completed in late October 2020. Delays and potential cost overruns are expected to be mitigated through supervening events under the project agreement whereby the grantor must pay the project company to cover unavoidable costs or direct losses.

Broadband Prospects Remain Strong in the US

The proportion of the US population with access to a high-speed broadband service has increased gradually to approximately 75% in 2019 from 1% in 2000. Much of this growth was experienced up to 2010, and since then the growth rate in broadband adoption has been notably slower.

The lockdown measures in the US have highlighted the necessity of internet connectivity as well as the deficiencies in existing broadband infrastructure, underscoring the importance of expanded and improved access. Broadband initiatives are receiving more government attention and policy consideration due to the level of business, education and entertainment activity that has shifted online because of the pandemic. While economies continue to open, we do not expect this to change the trajectory of demand as business and education continue to accept and implement remote working and studying options.

Rural and economically disadvantaged communities represent much of the broadband deficit across the US. Given the costs associated in connecting these underserved markets, future projects will require public-sector support, through either direct investment or PPP. The coronavirus pandemic and associated economic contraction has led to budgetary constraints and escalating costs for many states and local governments, and this may limit the ability and capacity for governments to take on large-scale infrastructure investment at this time. Project exposure to demand risk could increase, as could private sector contributions to the funding of these projects.

Many governments have various, previously existing initiatives to increase broadband access but will need to explore alternative funding sources. Private-sector interest and participation will benefit from the inclusion of commercialisation clauses that allow private developers to lease spare capacity to last-mile and wholesale providers.

Latin American Opportunities Are Developing

Most broadband investments conducted in the region have been implemented directly by private telecom companies and have been focused upon areas where the projects are economically viable without government support.

In Mexico, for example, the government-controlled electricity company, Comision Federal de Electricidad (CFE), created in mid-2019 the subsidiary CFE Telecomunicaciones e Internet Para Todos, (CFE Telecommunications and Internet for Everybody), with the purpose of increasing internet access to rural areas. No PPP plans have been announced, but private participation may happen in the future.

In June 2018 a broadband PPP was launched in the Brazilian state of Piauí, in the northeast region of the country. The 30-year concession contract has completion and performance risks assumed by the concessionaire; the grantor is the Information Technology Agency on behalf of the State of Piauí. The monthly

grantor payment is subject to performance deductions if specified targets are missed. As of June 2020, over 70% of the total connections and network (over 5,000 km) had been completed.

In Peru, the design, financing, construction, installation and operation of a 13,400 km fibre optic backbone network across the national territory of Peru was granted in 2014 by the Republic of Peru - represented by the Ministry of Transportation and Communications (MTC) in the capacity of grantor, and Azteca Comunicaciones Peru S.A.C. (ACP) as concessionaire. The concession agreement will be in effect for 20 years, with the aim of connecting 22 regional capitals and 180 provincial capitals.

The project was financed through notes issued by Red Dorsal Finance Limited, a limited liability company incorporated in the Cayman Islands, and was backed by investment recognition payments. The transaction is rated by Fitch's Structured Finance team as it is not exposed to completion or performance risks. The notes are rated 'BBBsf', one notch below Peru's rating (BBB+/Stable), as Fitch believes that the credit quality of the government's obligation is one notch below the sovereign's Long-Term Foreign-Currency Issuer Default Rating - see 'Red Dorsal Finance Limited', published 4 May 2015, for further details.

Asia-Pacific Investment Is Largely Through Private Capital

Most of the broadband infrastructure investment is funded by private operators in Asia-Pacific. These are mostly funded internally or by equity or debt finance raised at the corporate level. The balance is by way of non-recourse project finance loans. Private investment is also largely focused upon and limited to the developed markets in Asia-Pacific.

Public and PPP funding of broadband infrastructure is limited, although it is likely to grow given the increasing importance of improving connectivity. The importance of broadband infrastructure in addressing social and economic disparities is widely recognised. It is recognised as essential service.

Increasing public funding or participation is also likely to improve risk allocation and sharing, which will provide opportunities for the additional participation of private capital, especially across developing markets in Asia.

Point-to-Point Fibre Links

Another way to spur private investment to increase internet connectivity is the development of closed fixed-line networks. IslaLink, which connects the Balearic Island to mainland Spain through fibre optic cables, is an example of this. Key considerations when assessing closed fixed-line networks would be the terms and tenor of contracted revenue and the creditworthiness of these counterparties. Fitch would also consider the possibility of alternative service methods and competitors to the service and whether this could affect the sustainability of any debt financing.

Fitch's Alternative Infrastructure Asset Approach

The coronavirus pandemic has made it abundantly clear that high-speed internet access is an essential service - both at home and for businesses to continue functioning.

If the broadband assets are held in a fully ring-fenced SPV and have demand- or availability-based revenue structures as well as some form of operating or performance risk, or both, Fitch's analysis would be based mostly upon its [Infrastructure and Project Finance Rating Criteria](#). It would also draw upon the relevant key rating drivers (KRDs) from this criteria report and other sector-specific criteria for which the project shares similarities, such as the [Availability-Based Projects Rating Criteria](#). These KRDs would be considered where relevant, as in the list on the right, to analyse a project and reach the final rating outcome.

Applicable Factors for Analysis

- Completion risk
- Revenue risk
- Operation risk
- Infrastructure development and renewal
- Debt structure
- Counterparty risk
- Macro risk

Volume or Availability Revenue Perception

One key distinction in Fitch's analysis would be the revenue framework. While some broadband PPPs receive fully availability-based revenue from the public sector grantor, others also have a variable component linked to demand for the service provided by the project. This may be paid by either the public or private sector, and a consideration of the credit quality of the counterparties obligation is key in both scenarios.

For demand-based revenue Fitch would look to the expertise of third-party consultants and due-diligence reports to inform its view on the probable demand and resulting volume risk to the project. Unlike the toll road sector, which has decades of forecasts and performance data, the broadband sector is fairly new - as are its forecasts - and therefore the lack of these reports will be viewed as a weaker feature of the transaction

Fitch's analysis would lead to an assessment of the revenue risk KRD that is used to assign appropriate assumptions to be used in the Fitch rating case (FRC). To ensure our ratings are robust and on a 'through-the-cycle' basis, the FRC intends to forecast a 'reasonable downside' scenario for demand and volumes.

Financial Profile

The qualitative analysis of the KRDs is in conjunction with an analysis of the financial profile of the issuing entity to assess the cash flow available to repay each rated debt instrument. Fitch will apply various stresses to the performance of the project to forecast a reasonable downside scenario, which would form the FRC. From this, the relevant metrics for the transaction will be analysed, often the depending upon the debt structure features of the transaction.

Transactions with bullet maturities lead to a focus on leverage ratios of net debt/EBITDA, and project life coverage ratios (PLCR), when assessing the project's ability to repay the debt over the project's expected life. However, for transactions with fully amortising debt, service coverage ratios would be focused upon. Should the rated debt incorporate balloon or cash-sweep features, the loan life coverage ratio (LLCR) or PLCR may be most applicable.

The financial ratios under the FRC would then be compared with those of peers to position the final rating level and ensure a consistent assessment. The peers for comparison may not be in the same sector but would share similar qualitative assessments and operational risk profiles.

For purely availability-based revenue PPP projects, Fitch may use its [Availability-Based Projects Rating Criteria](#)'s indicative coverage ranges as a benchmark to position the rating level. The criteria indicate that a debt service coverage ratio (DSCR) of 1.15–1.30x for projects with a 'midrange' cost risk under the FRC for the 'BBB' rating category.

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