European Commission

Investing in local and regional Gigabit broadband deployment

Opportunities and challenges for market investors in the EU

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GLOSSARY

Infrastructure fund: Investment fund active in infrastructure assets (roads, airports, telecoms, …).

Active/Passive investor

Active Investor: investor targeting a stock appreciation in the mid-term (7-10 years).

Passive investor: investor targeting a regular yield with long-term buy-and-hold approach (20+ years).

Greenfield/Brownfield

Greenfield investment: construction and exploitation of a brand-new industrial asset.

Brownfield Investment: acquisition (and potential extension) of a running industrial asset.

Core Infrastructure: The most stable form of investment, usually the most essential assets for society.

Partners

LP= Limited Partners: Companies that invest in investment funds (usually institutional investors).

GP= General Partners: Companies that run investment funds (asset managers).

Home Passed: Premise to which an operator has capability to connect for a project in an area.

ARPU= Average Revenue Per User.

Take-up rate: Percentage of subscriptions over number of homes passed connected.

Overbuild: Exaggerated number of infrastructures deployed regarding long-term demand.

Land grabbing: All kind of actions designed to pre-empt an area for an intended future project.

Red tape: Excessive, rigid, or redundant bureaucracy.

BCRD= Broadband Cost Reduction Directive: set of measures to reduce the cost of deploying high-speed networks.

Claw-back mechanism: a scheme by which an excessive profit generated by a public subsidy is shared by the grant recipient with the public authority.

IRU Indefeasible Right of Use: Permanent lease contractual agreement (usually long-term: 20+yrs).

Bullet loan: Capital is fully reimbursed at its maturity. During the project, only interests are paid.

Mini perm: “a type of short-term financing traditionally operated in real estate. It is used to pay off income-producing construction or commercial properties. "Perm" alludes to

traditional permanent financing, which, in the case of the mini perm, the borrower has not yet been able to secure. Mini perm financing is something a developer would use until a project has been completed and can start producing income". (Source: Investopedia.com).

Payback: The number of years for the cumulated profit to equal the cumulated investment.

RoE= Return on Equity: net income over shareholders' equity.

RoI= Return on Investment: gains on an investment relative to its cost.

Cashflow: Amount of cash transferred in and out a company (usually in relation to a project).

Discounted cashflow: The value as of today of a future cashflow, through a risk-related interest rate.

NPV= Net Present Value: Total of the annual discounted cashflows over a certain period of time.

IRR= Internal Rate of Return: Discount rate that makes the Net Present Value (NPV) equal to zero.

EXECUTIVE SUMMARY (English)

In the "2030 Digital Compass" communication, the EU Commission has proposed **clear and ambitious targets on digital infrastructure for 2030**: *"All European households will be covered by a Gigabit network, with all populated areas covered by 5G".* In 2020, the investment gap at EU level has been **estimated at €250bn** (source EIB) to deploy Gigabit and 5G in order to reach the mid-term targets for 2025. Private investment will therefore be essential to meet the 2030 targets, potentially leveraged by European and national public funding and financial instruments.

In the last decade, industrial and financial investors have developed **a strong appetite for digital infrastructures**. Because of a global saving glut and the Central Banks expansionary policies, financial markets have been fuelled by large market liquidities while at the same time, fibre was increasingly considered as a future-proof technology, turning now digital into a "core infrastructure asset". In the last 2 years, COVID crisis has even amplified the phenomenon making digital **an essential infrastructure**, often called the '*4th utility'* by investors. The large vertically integrated historical players (Telcos) having now to cope in the short term with massive investments (FTTH, 5G and for the incumbents, copper termination), it creates numerous and substantial market opportunities for challengers/start-ups in a **large industry transformation**. It looks today as a "land rush", where the "new frontier" is always further ahead.

When assessing an opportunity, investors usually address **3 sets of criteria**: its "investment-friendliness" profile (i.e., whether public authorities make the investment safe in the long-term), its potential "financial return" (i.e. whether the risk taken will be paid back) and its possible "execution risks" (i.e. what are the roadblocks for the deployment and how can they be removed"). According to interviews, investors address all kinds of parameters within these categories and carefully examine ways of improving the case. In order to trigger/accelerate private investment, public authorities (at EU/national level) should act, notably **by enhancing the "long-term visibility"** of investments and by providing a strong and effective field support to **remove visible or hidden deployment barriers**.

Investors on digital infrastructures can be **classified in 4 categories**: equity investors (usually infrastructure funds), debt lenders (commercial banks, debt funds, NPBIs), institutional investors (pension funds, insurance companies) and industrial investors (large companies such as telcos, fibrecos, towercos… and entrepreneurs). All these players have been **increasingly active** in the last years. While their risk/return expectations are fundamentally different on projects, they have been developing partnership on opportunities, completing project fundings and decreasing the investment risks one another. They all consider today that in the EU landscape, money is available, but investment opportunities should be **more visible**, backed by **solid political and regulatory frameworks** and local/regional **supportive public actions** for rolling out more quickly and easily.

The current favourable financial conditions and the investment attractiveness of digital infrastructure call now for **private investment as much as possible** and public funding only when really necessary. For more efficiency, public authorities should push for **large-scale projects** (by gathering several municipalities) and encourage investment in the riskiest area by helping project promoters to reduce the time to get the first revenues and by ensuring them a long exploitation potential. Grants should be seen as **an opportunity to trigger private investment** and as the loop-back variable in the funding.

As a priority, public funding should be directed (1) **to facilitating the emergence of projects and teams** by delivering technical assistance to municipalities, by training/coaching and exposing entrepreneurs to investors, and by increasingly supporting

small projects through CEBF and (2) **to developing a tailor-made support in 'deep rural' areas**, where public grants combined with cost reductions generated by a mix of alternative technologies (FWA, 5G, Satellite) could address substantial market failures.

Public authorities also have a role to play **to develop fruitful connections** between project promoters and investors. We recommend the European Commission **to set-up 5 initiatives** with a support from the Broadband Competence Offices: **an advisory committee** that could gather the various kinds of investors around the EU Commission, **a portal** for match-making projects with investors, **an annual European investment event** as an opportunity for networking, **an academy** providing investment-readiness trainings to promoters and finally **national networking events** in the member states.

RESUME (Français)

Dans la communication "Boussole numérique 2030", la Commission Européenne a **proposé des objectifs clairs et ambitieux en matière d'infrastructure digitale pour 2030** : *"Tous les ménages européens seront couverts par un réseau Gigabit, toutes les zones peuplées étant couvertes par la 5G".* En 2020, le déficit d'investissement a été **estimé à 250 milliards d'euros** (source BEI) pour déployer le Gigabit et la 5G afin d'atteindre les objectifs à moyen terme pour 2025. L'investissement privé sera dès lors essential pour atteindre les objectifs de 2030, en mettant à profit les financements publics et les instruments financiers européens et nationaux.

Au cours de la dernière décennie, les investisseurs industriels et financiers ont développé un **fort appétit pour les infrastructures numériques**. En raison d'une surabondance d'épargne au niveau mondial et de politiques expansionnistes de banques centrales, les marches financiers ont été alimentés par d'importantes liquidités de marché alors que dans le même temps, la fibre était de plus en plus considérée comme une technologie pérenne, transformant désormais le numérique en un investissement d'infrastructure de type "core asset". Durant les 2 dernières années, la crise du COVID a même amplifié le phénomène faisant du numérique une **infrastructure essentielle**, souvent appelée le "4ème service d'utilité publique" par les investisseurs. Etant donné que les grands acteurs historiques intégrés verticalement (opérateurs télécoms) ont actuellement à faire face à court terme à des investissements massifs (relatifs à la fibre, la 5G et pour les anciens monopoles à la terminaison en cuivre), cela crée de nombreuses et substantielles opportunités pour les challengers ou les start-ups dans le cadre d'une **grande transformation industrielle**. Elle apparait aujourd'hui comme une "ruée vers la terre", dans lequel la "nouvelle frontière" est toujours plus loin.

Lors de l'évaluation d'une opportunité, les investisseurs **se basent généralement sur 3 groupes de critères** : son profil "favorable à l'investissement" (c.-à-d., si les pouvoirs publics rendent l'investissement sûr à long terme), son retour financier potentiel (c.-à-d. si le risque pris sera payé de retour) et ses possible risques d'exécution (c.-à-d. quels sont les obstacles au déploiement et comment peuvent-ils être supprimés). D'après des entretiens, les investisseurs traitent toutes sortes de paramètres au sein de ces catégories et examinent attentivement les moyens d'améliorer le cas. Afin de déclencher/accélérer l'investissement privé, les autorités publiques (au niveau européen et/ou national) devrait agir, en particulier en **améliorant la "visibilité long terme"** des investissements et en apportant un soutien solide et efficace pour **éliminer les obstacles au déploiement, qu'ils soient visibles ou cachés**.

Les investisseurs en infrastructures numériques peuvent être **classifiés en 4 catégories** : les investisseurs en actions (généralement des fonds d'infrastructure), les prêteurs (banques commerciales, fonds de dettes et banques et institutions nationales de promotion économique NPBIs), investisseurs institutionnels (fonds de pension, compagnies d'assurance) et investisseurs industriels (grandes sociétés comme les opérateurs télécoms, les opérateurs de fibre, les gestionnaires d'infrastructures passives … et les entrepreneurs). Tous ces acteurs ont été **de plus en plus actifs** ces dernières années. Bien que leurs attentes en matière de risques/rendement soient fondamentalement différentes sur les projets, ils ont développé entre eux des partenariats sur des opportunités, complétant ainsi le financement de projets et diminuant les risques pris par chacun. Ils considèrent tous que dans le paysage actuel européen, l'argent est disponible mais que les opportunités d'investissement devraient être **plus visibles**, soutenues par des **cadres politiques et règlementaires solides** et par des **actions publiques de soutien** au niveau local/régional pour un déploiement plus rapide et plus facile.

Les conditions financières favorables actuelles et l'attractivité des investissements dans les infrastructures numériques appellent actuellement **à un investissement privé autant que possible** et à un financement public uniquement quand cela est réellement nécessaire. Pour plus d'efficacité, les autorités publiques devraient pousser au développement de **projets à large échelle** (rassemblant plusieurs municipalités) et encourager l'investissement dans les zones les plus risquées en aidant les porteurs de projet à réduire le temps nécessaire avant de générer les premiers revenus et en leur assurant un potentiel d'exploitation longue. Les subventions devraient être considérées comme **une opportunité de déclenchement de l'investissement privé** et comme une variable de bouclage dans le financement.

En priorité, les financements publics devraient être orientés **(1) vers l'aide à l'émergence de projets et d'équipes** par de l'assistance technique aux municipalités, par la formation, le coaching et l'exposition des entrepreneurs aux investisseurs et par le soutien croissant de petits projets via le *« Connecting Europe Broadband Fund »* (CEBF) et (2) **vers le développement d'un soutien sur-mesure dans les zones de « rural profond »**, où les subventions publiques combinées à des réductions de coûts générées par un mélange de technologies alternatives (FWA, 5G, satellite) pourraient remédier à d'importantes défaillances de marché.

Les autorités publiques ont aussi un rôle à jouer **pour développer des liens fructueux** entre les porteurs de projet et les investisseurs. Nous recommandons à la Commission Européenne de **mettre en place 5 initiatives** avec le support du réseau des *« Broadband Competence Offices »* (BCOs) : **un comité consultatif** qui pourrait rassembler les différents types d'investisseurs autour de la Commission Européenne, **un portail** pour la mise en relation des projets avec les investisseurs, **un évènement annuel européen sur l'investissement** qui puisse être une opportunité de réseautage, **une académie** offrant des formations de préparation à l'investissement aux porteurs de projet et enfin **des évènements nationaux de réseautage** au sein des Etats membres.

1. CONTEXT

a. The EU has set up strong ambitions in Gigabit broadband deployment

The European Union has the vision of a digital economy that delivers sustainable economic and social benefits based on modern online services and fast internet connections. The rapid evolution of technologies, the exponential growth in broadband traffic and the increasing demand for e-services calls for **ambitious broadband coverage targets** in order to achieve more growth, competitiveness and productivity.

The recent COVID-19 outbreak has shown the importance of having access to resilient, high-capacity electronic communications networks everywhere for ensuring the continuity of economic activity and social life, but this has also highlighted some limits in current network infrastructures, regarding their available capacity, resilience as well as coverage.

Taking stock of both the importance and the urgency of rolling out digital infrastructures, the Commission has set up clear targets for 2030: ***"all European households will be covered by a Gigabit network, with all populated areas covered by 5G"***[1].

b. Funding Telecom infrastructures is a long-term EU challenge

A considerable investment gap of €300-400bn, that will be hardly met by EU operators

A study for the FTTH Council Europe concluded that the cost of building FTTH in areas where an FTTH network is not yet available would be **€137bn**[2], when including cost saving opportunities achieved under the Broadband Cost Reduction Directive. In 2020, the EIB estimated the investment gap in rural areas to reach the 2025 targets as of **€200+bn**[3].

In addition, according to GSMA, Europe should invest close to **€200bn** in 5G capex.

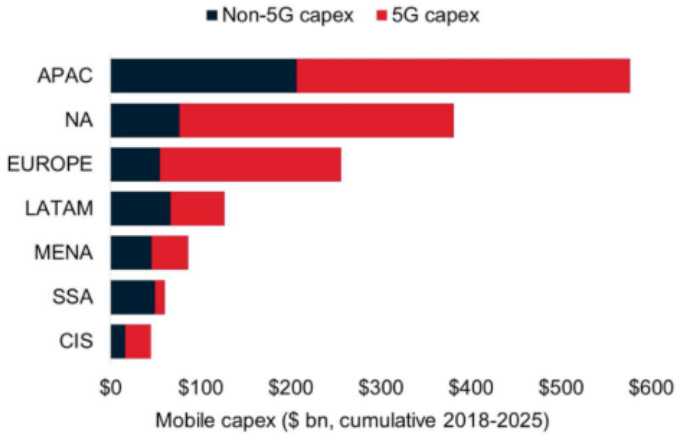


Figure 1. Mobile capex by region[4] (Source: GSMA)

[1] https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en
[2] http://ftthcouncil.eu/documents/Reports/2017/FTTH%20Council%20Cost%20Model%202017_final.pdf .
[3] https://www.euractiv.com/section/agriculture-food/news/eib-official-e200-billion-needed-to-build-broadband-infrastructure-in-eu-rural-areas/
[4] APAC: Asia Pacific, NA: North America, LATAM: Latin America, MENA: Middle East North Africa, SSA: Sub-Saharan Africa, CIS: Commonwealth of Independent States

In its communication "Shaping Europe's digital future"[5], the Commission has estimated an annual investment gap at EU level of **€65bn** for digital infrastructure and networks. This represents a staggering amount when considering that the total annual CAPEX (excl. spectrum fees) is **around €45bn** a year, cumulated from all European telecom operators (fixed and mobile).

Although required, public support from the EU and national authorities will not be enough

In the last years, member states and the European Commission have developed many initiatives to support broadband deployment, with **a clear focus on market failure areas**.

a. National Broadband Funds

To meet fiber deployment targets, National broadband schemes have been set up by Member States and have in some circumstances made a significant contribution over several years to project funding e.g., for Germany (€3bn), France (€3bn) or Italy (€4bn).

Set up usually for 10 years by the beginning of the 2010s, all these National broadband schemes are currently **coming to an end** or have a very limited remaining funding.

b. European Structural and Investment Funds and the Recovery and Resilience Facility

Over 2014-2020, the Commission has deployed grants for more than **€6bn** from the ESIF (ERDF and EAFRD programmes) on selected eligible projects.

Over 2021-2027, ESIF programmes will continue to provide grants. However, in that area, the new Recovery and Resilience Facility (**up to €338bn in grants**, with 20% on digital but not only on infrastructures) is more likely to support member states' initiatives.

In fact, the financial level will finally depend on each national choice of key priority areas.

c. CEF Digital and the Connecting Europe Broadband Fund (CEBF)

With a budget of **€1.8bn** over 2021-2027, CEF digital will fund connectivity projects of common EU interest and contribute to deploying Gigabit and 5G networks across the EU. CEF Digital targets are:

- To contribute to the deployment of and access to safe and secure very high-capacity digital networks and 5G systems.
- To support an increased security, resilience, and capacity of the digital backbone networks in the EU.
- To foster the digitalisation of transport and energy networks.

As a part of CEF Digital, the Connecting Europe Broadband Fund (CEBF) is an EU public equity investment initiative to promote broadband investment in underserved areas.

Initially funded by the European Commission and the European Investment Bank, together with three National Promotional Banks, it has reached **€555m** backed by private investors. It has made today 8 early-stage investments in different EU countries.

[5] https://ec.europa.eu/info/sites/default/files/communication-shaping-europes-digital-future-feb2020_en_3.pdf

The CEBF aims now at growing significatively in the next 7 years to leverage even more investments in underserved areas.

The relative size and the 'market failure' focus of all these European and national public initiatives show they **cannot immediately meet** the total investment needs.

c. Private investors provide a clear funding opportunity for broadband

The last years have seen a growing number of private investment operations supported by equity investors (Infrastructure funds, Institutional Investors, Public funds…) and by money lenders (Banks, National Promotional Banks). Telecom infrastructures can present today an **attractive "Risk-return"** to investors, and this is a clear opportunity for funding Telecom Infrastructure through private investors.

Several operation types have recently occurred on the European market:

1. Minority stake in operators

It represents an opportunity for the operator to valorize its business assets while getting additional funding to further and faster extend its network: as an example, the sale by Altice of a minority stake (49.9%) of its French fibre subsidiary to a consortium led by OMERS Infrastructure, Allianz Capital Partners and Axa IM for €1.8bn.

2. Direct equity investment in projects

Infrastructure Funds can provide the relevant complementary equity funding to develop the project: as an example, DIF Capital Partners, an independent fund manager has taken 80% of a Joint Venture formed with Cinia Oy to develop FTTH networks in Finland.

3. Direct loans in projects

Banks are very active to provide the required long-term funding complementing the equity investment. As an example, the German bank HSH has backed in 2019 DST-telecom, a Portuguese fibre optic wholesaler for €50m, on top of an original funding of €120m.

4. Acquisition of networks

Investment Funds acquire telecom networks as part of a long-term asset investment strategy. EQT (51%) and OMERS (49%) have acquired Deutsche Glasfaser, a German broadband operator.

5. Institutional investors investing in infrastructure funds

Institutional investors (pension funds and insurance companies) invest traditionally in venture funds (as LPs). They have increased their presence in telecom infrastructure funds in Europe. As an example, the Railways Pension Scheme invested £35m in the infrastructure fund of Infracapital to build up broadband infrastructure in the United Kingdom, notably in the Gigaclear UK roll out.

d. Objectives of the project

This project aims at gaining a better understanding of how public interventions could better leverage private investment in digital infrastructure, so as to bridge the gap. It **focuses on FTTH deployment,** but some sections cover the perspective of 5G.

It is supported by **more than 60 interviews** of equity funds, debt funds, commercial banks, institutional investors, national promotional banks and institutions, operators, fibercos, towercos, regulators and national public authorities.

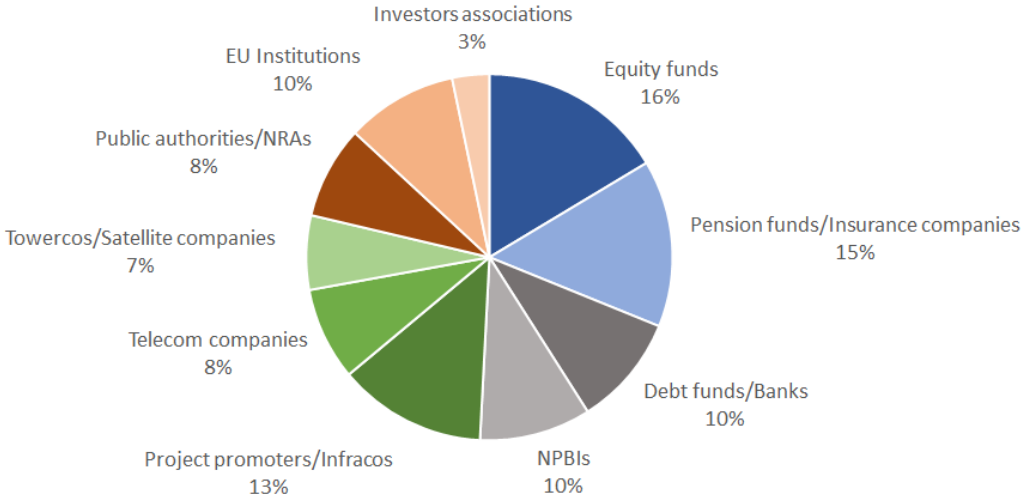


Figure 2. Profiles of the study interviewees

2. A NEW ERA FOR THE EU TELECOM INVESTMENT LANDSCAPE

In the last 40 years, the telecom sector has dramatically evolved.

From the deregulation of the Plain Old Telephone Service (POTS) in the 80s, to the waves of Mobile Operators in the 90s and of Internet Service Providers in the 2000s, the financial industry has always been very active to fund network companies and projects, supporting incumbents and/or challengers in their ambitions.

But now, with the current technology shift around fiber and 5G, the financial industry **could act even deeper in the value chain,** potentially reshaping the whole telecom landscape in the EU.

a. Investors have developed a strong appetite for digital infrastructures

For a long time, the Telecom sector has been seen in the Private Investment space as belonging to Private Equity (i.e., providing capital investment to companies that are not publicly traded). The interest from the infrastructure space came about 10 years ago which the surge of new projects in cable/fiber and wireless. It recently accelerated with the favorable financial market conditions.

Massive funding needs and large available liquidities drive a deep industry transformation

The shift from copper to fiber has created **massive investment needs** for incumbents, requiring strong balance sheets but also often serious organizational transformations. These large-scale projects require mobilization of all resources as well as smooth decision-making and monitoring processes, which are not so easy for large corporates. Besides, customer conversion to fiber creates also risks on margin level sustainability. Therefore, many incumbents have been **long to react**, trying first to protect and “milk the cow” on their existing network before investing in new technology networks.

It has hence created in the whole EU **market-entry opportunities** for challengers/start-ups, provided they bring a better focus, more speed and agility to grab some geographic areas that were discarded or not yet targeted by incumbents.

In the wireless space, the gradual disengagement of operators on passive infrastructure has led to the growth of towercos. The coming development of 5G telecom infrastructure could as well create new opportunities for challengers in the wireless space (e.g., regarding microcells).

At the same time, financial markets have been in the last 10 years **massively fuelled by liquidities**, mainly coming from Central Banks expansionary policies (e.g., FED and ECB) driven by low interest rates, combined with a global saving glut. Institutional investors (insurance companies, pension funds), asset management companies but also commercial banks have thus been looking for long term investments with attractive “risk-return” patterns.

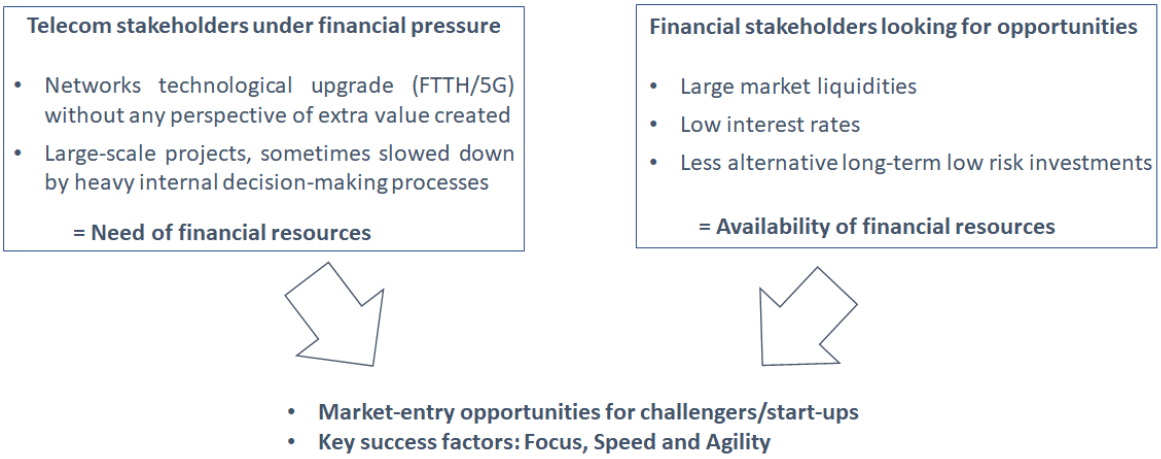


Figure 3. Drivers of the current industry transformation

All this has created a new infrastructure investment market, where incumbents and challengers get funding for their long-term projects, leading to **a deep industry transformation**.

Verbatims

- *"The financial market is fuelled by massive liquidities, notably targeting telecom infrastructure. The challenge for fund managers is more to find project funding opportunities that present an adequate risk reward."*
- *"Because of liquidity volumes in financial markets and some asset classes become trendy for placement, insurers and pension funds tend also to invest in equity."*
- *"Thanks to large available liquidities on financial markets, funding fiber is no more an issue even in rural areas."*
- *"The appetite of institutional investors towards infrastructures has grown massively in the last few years. Our clients represent hundreds of billion euros worth on their balance sheets, and they want to be deploying multiple billion of euros every year across infrastructure, notably in the digital space. This is constantly growing, and the scale of the appetite is such that, there is a scope to deploy more and more opportunities."*
- *"We appreciate the level of broadband need and we have invested in various FTTH/FTTP projects, both directly and indirectly. The investment growth is so massive and participants to this market are so numerous that, from an asset allocation perspective, there is kind of a saturation now in the portfolios. When an investor follows the market growth, he/she is quickly very exposed to this sector. If we follow the trend in deal flow, Telecoms would be 60% of our portfolio, which would be then totally unbalanced."*

For investors, Telecoms are today very privileged infrastructure assets, seen as "a 4th Utility"

In the last 10 years, there has been a growing interest for Telecoms when compared to other infrastructures for 3 major reasons:

- Like water, sewer, gas, electricity… telecoms are seen as **an essential infrastructure** in the economic space but also in the social space (COVID-19 has also highlighted their impact on education, healthcare, public services, ...).
- Telecoms have **a limited correlation to economic downturns,** compared to other assets such as transport (highways, airports, …) or some natural resources (gas). Demand is steadily growing.
- Telecoms present today for investors **many greenfield[6] opportunities (with higher IRRs)** when other sectors (including renewables) are turning now more brownfield[7].

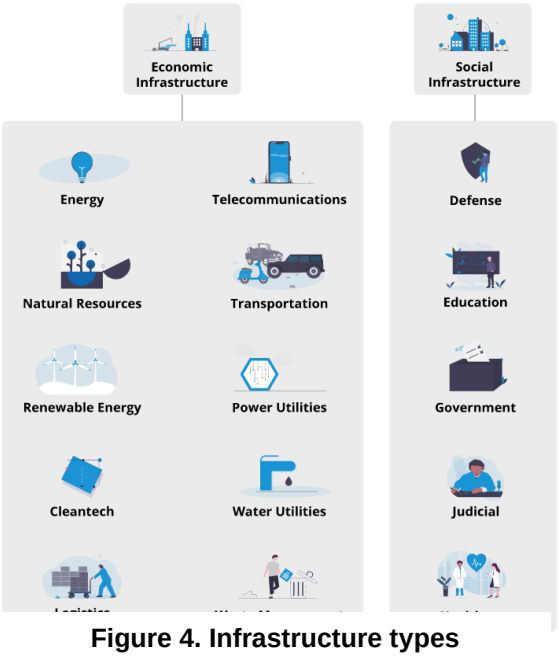


Figure 4. Infrastructure types
(Source Preqin.com)

Telecom infrastructures (FTTH, Towers, Data Centers…) leverage both on the strong, steady, and long-term societal demand for connectivity and speed, and on their relative financial attractiveness when compared to other asset types (including renewables which was the last investment wave).

In the eyes of investors, Telecom infrastructures look both **in the short term as a commercial asset** (dealing with competition) but also **in the long term as a commodity,** and potentially a monopoly-based price-regulated asset (e.g., FTTH looks very similar to power transmission and distribution).

Verbatims

- *"FTTH is becoming a commodity, just like power networks."*
- *"FTTH could be considered close to well-known Gas or Electricity network's investment models."*
- *"It is a strange regulatory situation today as there is an incentive to develop commercial networks that at some point in time could be regulated as monopolies."*
- *"The risk of a regulation of wholesale networks are rather limited as they are open on a non-discriminatory basis and price levels are quite framed by long-term contracts (20+ years)."*

[6] Greenfield investment: construction and exploitation of a brand-new industrial asset
[7] Brownfield Investment: acquisition (and potential extension) of a running industrial asset

b. Investors take advantage of long-term industry trends

Financial investors have developed a deep business understanding of the various Telecom assets and are participating to different industry transformations happening in the Telecom landscape.

Investors have a selective interest for each asset class of the digital infrastructure market

The digital space covers 3 major asset types, with very different positions in an industry life cycle:

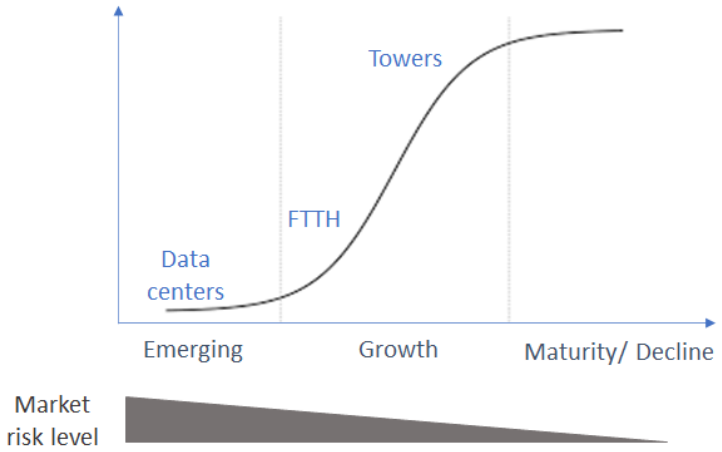


Figure 5. Digital Infrastructure asset types on an industry lifecycle

- **Towers:** These assets are close to a maturity stage with no forthcoming product / technology innovation. There is still some growth opportunity but the current industry consolidation by strategic investors (large industrial companies) has driven asset prices very high, with little financial upside.
- **FTTH:** These assets are at an early growth stage with a future-proof technology. There is a high-end user demand and many greenfield infrastructure opportunities, backed by European/national broadband plans. This is today the core investment part and a hot topic.
- **Data centers:** These assets are at an emerging market stage with various business profiles (in terms of size, contract types, technologies…). There is a constant innovation, but customers are local and usually considered more loyal/sticky. Investors are today quite selective.

Other asset types include:

- International backbones: It is usually seen as a quite speculative area which require some large size clients and strongly tied long-term contracts to cover commercial risks.
- Smart cities: It is a very emerging area where business models are still under construction.

FTTH appears today to investors as the **most attractive "risk-return" profile** in digital infrastructure, still at an attractive price: *"S&P Capital IQ data shows **EBITDA multiples for fibre infrastructure and broadband businesses at 6.8x, to the end of 2019** - significantly lower than wireless towers and data center at 26.5x and 28.3x respectively"* (source: Infrastructure Investor - Digital issue June 2021).

Investors are participating to a global reshuffling of the Telecom value chain

In the last10 years, the Telecom value chain has been driven by 3 major forces:

- **The 'fixed-mobile convergence'** that has pushed Telecom Operators to merge businesses into one single infrastructure with benefits of economies of scope and economies of scale.
- **The 'tower disruption'**: the gradual disengagement of wireless operators on passive infrastructure that has fuelled the growth of towercos, by creating synergies amongst tenants.
- **The 'bitstream disruption'**: the recent development of wholesale fibrecos has split the fixed value chain between infrastructure operators (active layer) and service providers (ISPs). A similar approach had been developed in the wireless value chain with MVNOs.

These industry trends create both a disintegration of the traditional vertical model and a reshaping of the global value chain made upon three layers: Passive assets, Active network, Service provision.

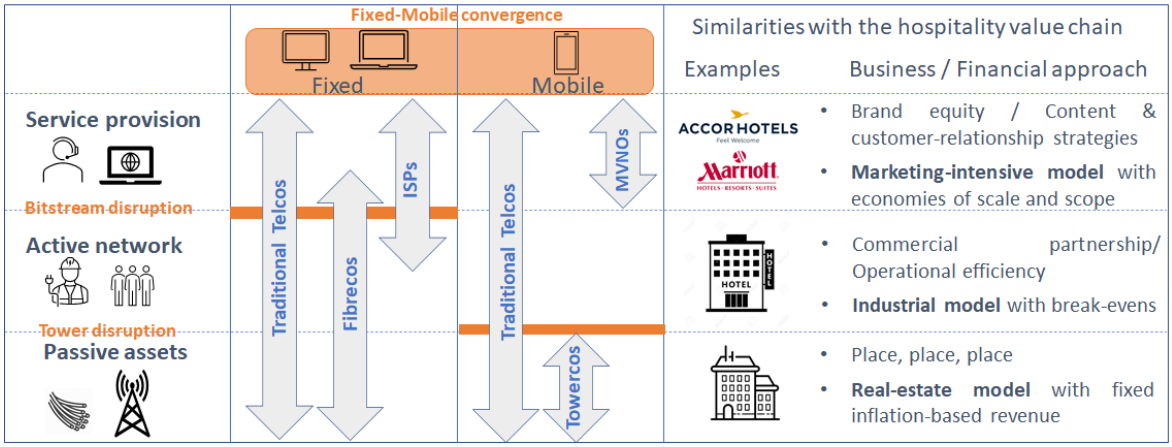


Figure 6. Reshaping of the Digital Infrastructure value chain

The digital infrastructure value chain appears then as very similar to the hospitality value chain:

- **Passive assets (Buildings)**: a real-estate model with the famous motto "place-place-place"
- **Active network (Hotels)**: an industrial model with break-evens upon volumes
- **Service provision (Hotel chains)**: a marketing-intensive model with economies of scale/scope

Many investors now question the long-term sustainability of traditional vertically integrated Telcos, as it seems like it will be a challenge for these players to continue to master all value chain layers. It would require them to mobilize significant financial resources.

Financial investors believe that *"standalone and focused companies can be operated more efficiently"* and therefore, given the digital infrastructure value chain, they invest in specific areas (mainly in fiber networks and towers) where challengers can develop a significant value creation.

Verbatims

- *"For traditional Telcos, fiber distribution is a key element to generate synergies between their FTTH and 45/5G businesses. In addition, the number of local data centers is growing, and Telcos integrate them in their infrastructure."*
- *"Regarding the 3 layers telecom model, the split between layers could be mainly between Bitstream business (Active layer) and Retail business, not so much with Dark fiber (Passive infrastructure)."*
- *"In the movement towards three value chain layers (passive, active and service), tower companies, and probably later fiber companies, will gradually move to the hand of "passive investors".*

c. Investors are calling for a long-term public policy on digital infrastructure

Whilst looking after opportunities in the EU, private investors are currently facing a nationally- fragmented public policy landscape and expect a long-term convergent EU regulatory framework.

Today, investors face a nationally fragmented public policy landscape

Investors underline **major public policy and regulatory differences** amongst member states. For example, market situation in France, Germany, Spain and Italy are completely different in terms of local authorities' mobilization, number of players, civil engineering obligations…

They usually have a limited knowledge of market situations in Central Eastern Europe (Poland excepted) and often pretend that regulatory and political frameworks in these jurisdictions can be **unclear and unstable**. Most of their interest is today in the Western part of the EU, focusing recently on France, Germany, Spain, and the Netherlands where there is space for challengers.

They would therefore expect **a common EU public policy framework** that could leverage successful national approaches regarding investment in digital infrastructure and could lead to a common EU investment model. Ideally, this would provide a clear single framework and facilitate largely their assessment of investment opportunities.

Verbatims

- *"There is in Europe an incredible variety of regulation models, that are also not always so clear."*

- *"There is a need to orchestrate fiber deployments at country/European level to better define the right use of subsidies, to prevent unfair competition and to avoid unnecessary costs."*
- *"Most investments take place in traditional markets (Western EU, Nordics) as investors tend to place a higher risk premium on eastern and southern countries for political and regulatory risks and uncertainties. There is a perception that the investment longevity is at risk in these jurisdictions."*
- *"In Europe, there is a need for a clear guidance from public authorities: more protection against overbuild and clear guidance and stringent process on subsidies."*

To make decisions, investors rely on a long-term investment horizon of 20+ years

Infrastructure investors are long term players. In all various infrastructure investment areas (from airports to renewables), **a typical project lifetime goes from 15 to 25 years**. In some cases, the investment horizon can reach even 50 years!

A typical infrastructure project has different phases, from design to building, exploitation and even sometimes decommissioning with **significant funding levels involved** (up to several billions of Euros). Payback[8] is long (usually 10+ years) and investors have clear return expectations (typically from 5-10% with low risk to 15%+ with high risk).

Visibility over the longer term is therefore critical in the investment decision. It also applies even when the investor sells its investment before the end of the project as the buyer would expect a visibility over the following period to accept to pay the price. It should be noted that Ofcom (UK) has recently taken a very investment-protective position, declaring: *"we recognize that full fibre is a long-term investment, taking more than a decade if not two to pay back. So, we aim to allow all companies the opportunity to achieve a fair return over their whole investment period,* ***and do not expect to introduce cost-based prices for fibre services for at least 10 years****"*[9].

In the current landscape, some investors consider that regulatory frameworks are fine for this decade but beyond that, they would call for **a clear long term convergent EU regulatory framework**.

Verbatims

- *"Generally, the business case is over 30 years."*
- *""We usually analyse projects over a 20-25-year lifetime."*

[8] Payback: moment when the cumulated profit equals the cumulated investment
[9] https://www.reuters.com/article/us-britain-broadband-idUSKBN2BA0M5

3. KEY DRIVERS AND PARAMETERS OF GIGABIT BROADBAND PROJECTS

Many factors are involved when making decisions on digital infrastructure investment opportunities: from the demand-side and the competition to the regulatory environment, the funding opportunities or even the barriers in the execution.

There is no one side-fits-all and all cases can be different. However, investors have usually 3 major focuses: the protective framework of the investment, the potential return, the risks in the execution

a. Investors first consider "Investment friendly" opportunities

Investors are looking for a safe, reliable environment over the longer term. They accept the risk of designing, building, exploiting, owning infrastructure assets if there will not be any major political or regulatory surprises. Project risk has a cost, but **risks that cannot be mitigated are generally NoGos**.

Before anything, the framework of the investment **must be protective**: it means to cover various external risks on political and regulatory parameters, from "country risks" to "unfair competition risks".

Socioeconomics, Competition and Public Support determine the "investment friendliness"

The "investment friendliness" character starts with positive socio-economic factors for the project development. But it also includes the competitive environment and finally the public support level.

Suburban/Urban looks usually attractive regarding socio-economic factors. Demand is strong with potentially high ARPUs, given high average wages and the presence of mid-size to large enterprises. These areas benefit also from a large availability of public passive infrastructure (ducts, backbones, electric networks…) and from a strong political support. However, the area attractiveness has a strong drawback regarding competition with the **presence of many players** and low barriers to entry.

Rural often looks as in a much **more challenging situation** as socio-economic factors can be weak notably regarding ARPU expectation and population density in the most remote areas. However, as every coin has two sides, competition is de facto more limited and public authorities provide funding schemes based on subsidies.

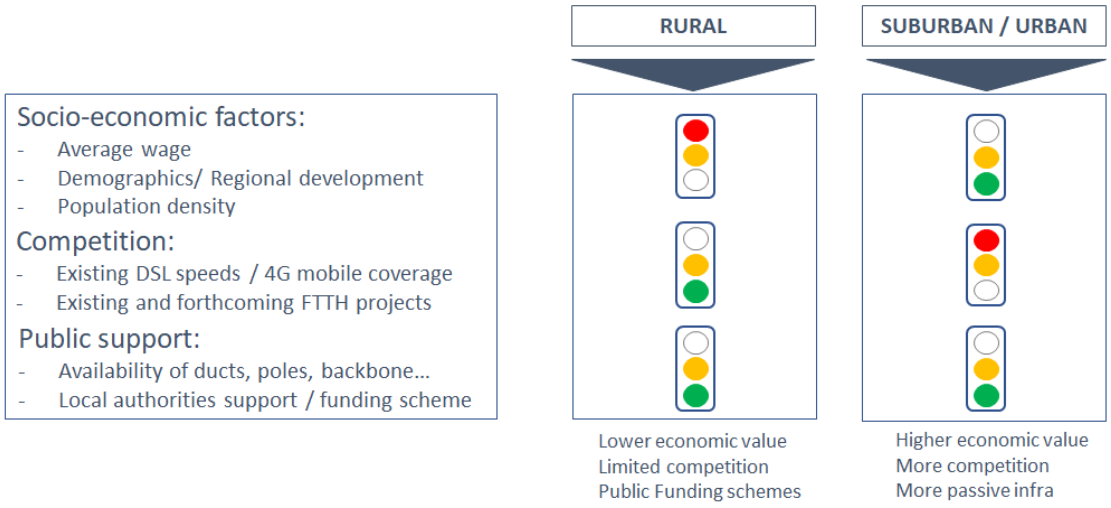


Figure 7. Comparison between Rural and Suburban-Urban environments

In fact, infrastructure investors really **appreciate rural areas**, even more than urban/suburban areas for their **"high barriers to entry"**: when an investment is made, it is almost impossible for another player to compete. It gives a strong economic protection.

With that in mind, in the investors' eyes, **the presence of subsidies can be a positive sign only it signals that a project cannot be profitable without them**. Hence, the beneficiary has a strategic advantage.

Verbatims

- *"We are part of the investors that are desperate to invest in underserved areas"*
- *"Even if it could be seen as counter intuitive, we prefer to finance rural projects with a definitive first mover advantage than in a highly competitive urban environment."*
- *"We focus on rural and semi-rural areas as where there is less competition and situations that avoids overbuild with multiple infrastructures through a wholesale model."*

Perspective of competition with legacy and potential overbuild are major decision factors

Investors globally consider that fiber connectivity is a long-term trend driven by strong demand, steady traffic growth and backed by a societal transformation towards more high-speed connectivity. They underline progress regarding perspectives for **fiber penetration rate**, even in rural areas. An investor noted: *"When just 5 years ago, the targeted long term penetration rate was about 50-60%, it is now **around 75-80%.**"*

COVID-19 pandemics is an accelerator, mainly because of "Work from Home" connectivity needs. This positive perspective for fiber penetration rate is globally pushing investors towards projects.

However, to decide on an investment, the main issue for investors is now **the competition risk**:

- **Legacy networks** (Copper, Cable) that could reduce fiber attractiveness by capturing demand for a lower speed which makes hard to demonstrate fiber additional value to users.
- **Potential overbuild**[10] that could directly affect their market share and therefore dramatically reduce the return perspective.

Investors underline that these are the critical factors where they would particularly expect protections from a public policy perspective.

- Regarding legacy networks, they claim that it should be a time-limited constraint and are pushing towards plans of **copper termination** as early as possible.
- Regarding overbuild, they note that current regulatory frameworks push towards a competition on infrastructure where in some cases it could have a very limited economic rationale. Solutions could be **local monopolies** or strong **regulatory disincentives**.

More generally, investors believe that the next 10 to 15 years will require significant investments for digital infrastructure roll-out. Investors will require "safe harbours" providing a minimum protection regarding competitive threats. Hence, they consider that in some specific cases and for some time **regulation should not encourage infrastructure competition** but instead push towards sharing assets.

It is worth noting that for investors, except in some countries like Finland, **5G do not represent a competitive threat** to fiber as connectivity speeds are lower. Besides, 5G could be a complement.

Verbatims

- *"Some players have unfair competition practices such as incumbents trying to pre-empt zones to affect our potential penetration rate. For example, they communicate on their future presence in an area just a few days after we have announced deploying in the zone. Or they actually overbuilt the other fiber player so that his business case in ruined."*
- *"The incumbent can have a very toxic attitude on the market, pre-empting areas simply by connecting just the highly profitable homes in village centers to its fiber network and making the rural areas much less interesting."*
- *"The risk of overbuild is the most prominent one."*
- *"We believe that public policies should favor migration from copper to fiber through a clear and non-discriminatory copper switch-off plan. The Green Deal could support this concept, considering the positive environmental impacts of FTTH. This would force incumbents to be more selective on development areas and accelerate fiber deployment overall."*
- *"MNOs have been offering unlimited data packages that clients used to stream at home. To protect their business, some mobile operators have even marketed their offers by overpromising quality".*

[10] Overbuild: Exaggerated number of infrastructures deployed considering the long-term demand

The French regulatory framework appears as a reference in the investors' community

In its broadband plan, France made the choice to split its territory in 3 parts according to population density and to organize competition differently in each part, privileging shared infrastructures:

- High density areas: full infrastructure competition
- Mid density areas: one single mutualized infrastructure run by one operator granted through a national tendering process
- Low density (rural) areas: one single mutualized infrastructure set up by local public authorities

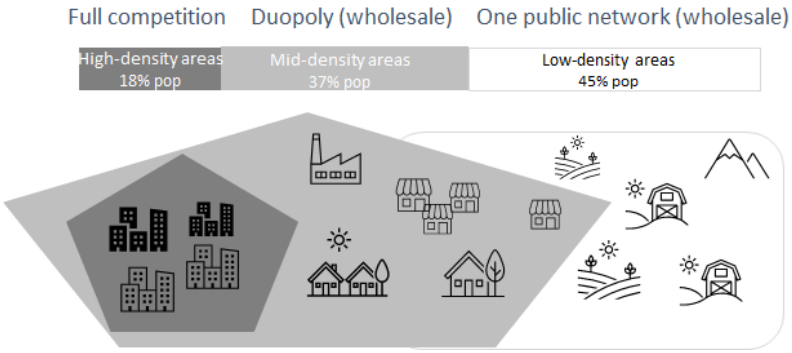


Figure 8. French broadband plan split in 3 areas

Regarding mid-density areas, they were finally granted to two national operators (Orange and SFR).

In low density areas, public authorities (generally French regions) have been in charge of designing the project but also building and operating it, either directly or through a long-term concession contract (15+ years) with a private company. The network owner is **then the only one to receive an official public political support,** including subsidies.

Many investors that have analyzed and sometimes invested in these "Public Initiative Networks" in rural areas as concession contractors underline that this type of framework provides (1) **a strong protection against potential overbuild** and (2) **a long-term revenue visibility over 15+ years**.

In such case, the rural network is not then a monopoly by regulation, but a ***'de facto'* monopoly** as once constructed, it looks almost impossible that other players decide to roll-out a second one.

The safe regulatory framework and the recent positive outlook on the potential penetration rate, conducted promoters to invest **without any subsidy** for the most recent tenders (Savoie region).

This regulatory framework is a reference in the investor's community, which would like it to be replicated in other countries. However, member states have now developed their own framework and if applicable, a potential integration in existing regulations might be somewhat difficult.

Verbatims

- *"The French broadband development model splitting the market in 3 zones has been really efficient as it has privileged wholesale models in some zones avoiding*

free fights over infrastructure and thereby avoiding unnecessary double fiber deployment costs and hence it has stimulated the fastest and most efficient fiber roll out."

- *"The French regulatory framework that has been put in place in 2013 was based on region-wide mutualized networks, often under concession models. This has attracted all types of investors, secured financing over a long-term and finally provided an interesting outcome by speeding up the roll-out and by reducing the overall cost. This could inspire some changes in the EU regulatory framework."*
- *"The French model has been successful with Concession DSP in rural zones (RIP) and with a share between SFR/Orange in semi-rural zones (AMII). It allows an effective / faster roll-out based on a secured perimeter."*
- *"France has developed an attractive model for national broadband deployment, but it cannot be applied everywhere as there is usually "no blank sheet of paper" and past decisions are not easy to change."*
- *"It is a relatively investor-friendly market, with an efficient model predicated on no network duplication in mid and low-density areas, where the economics of which would be hard to justify".*
- *"In France, the FTTH regulatory environment has been very attractive for investment, so that subsidies are now only requested for very remote areas (AMEL zones) where the cost per home passed is really high".*

b. Investors expect a 10% p.a. 20-year equity return with solid risk mitigations

The **risk-return trade-off** over a typical timeframe of 20+ years is a key determinant in the investment decision. Equity investors focus on the potential profit whereas debt investors focus on the financial risk.

As project risk usually decreases over time, equity expectations are **above 15% p.a. at an early investment stage and under 10% p.a. after 10 years**, making an average ar.10% p.a. over 20 years.

Economics of an FTTH project relies on 3 key financial drivers

The decision-making is based on cashflows forecasts, given deployment scenarios on homes passed[11]. Financial cashflows are mainly made of:

- The revenue flow with 2 drivers: take-up rate[12] and ARPU (or lease when sold through ISPs)
- The investment flow made of the CAPEX per Home Passed (HP)

Some operational costs are also factored in (operations, maintenance, marketing…).

[11] Home Passed: Premise to which an operator has capability to connect for a project in an area
[12] Take-up rate: Percentage of subscriptions over number of homes passed

CAPEX per Home Passed (net of subsidies): it varies widely (as low as €400-500 in Spain to €2,500-3,000 in Germany or even more in the Nordics) depending on various factors such as landscape, type of engineering (aerial or digging), availability of legacy passive infrastructure (poles, ducts…), construction labour costs, subsidies …

ARPU/Lease revenue: its level depends on the sales model (retail/wholesale), on the customer mix (home/business) and on offers (low-end/high-end). It also depends on the country (about 2-3 times lower in the CEE compared to Western EU)

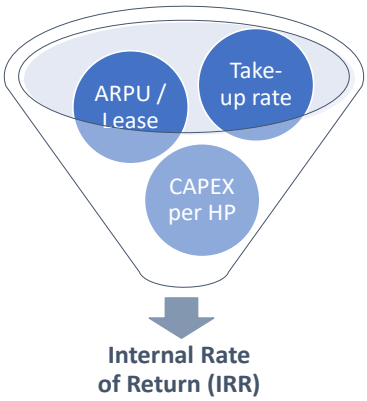


Figure 9.
The 3 major financial drivers

Take-up rate: it is the **most uncertain driver**, as it assumes a subscription level evolution from the first to the last forecasted day, usually reaching at the end an asymptote. It varies depending on end-user appetite for high-speed broadband, network construction speed and competition level (Fibre but also DSL, Cable or 4G/5G…)

Cashflows computed and projected over 20 years determine an expected return on investment (IRR). Extreme scenarios (including crash) are considered to examine the **IRR variability**.

The various business cases also serve debt investors (debt funds or commercial banks) for evaluating their propension to provide debt (amount, reimbursement pattern, interest rate, covenants, …).

Subsidies are usually considered as "easing the business case" by lowering the CAPEX per HP. However, subsidies also generate a clawback mechanism[13] that can affect the net return.

Investment assessment approach by a project promoter

"The starting point of the business case is to design and to assess the building cost of rolling-out the network on an area per area basis (such as polygons) corresponding to certain number of houses. The CAPEX per Home Passed is the main cost driver.

The second driver is the penetration rate (aka occupancy rate) of customers in that specific area. A 100% rate is improbable as there are other competing infrastructures available by other companies (Fibre, DSL, cable…). Generally, the business case is over 30 years, and penetration rate grows up to an asymptote.

The third driver is the ARPU depending on the sales model (retail or wholesale). We connect households, businesses, and some tower sites. Prices are assumed to grow with inflation over 30 years.

All that business computation gives the IRR that can reach 10%-15% p.a. for an active investor, provided certain conditions are met (i.e., no overbuilt by another fiber infrastructure). In such case, cash flow usually starts to be positive (break-even) after 10 years."

[13] Claw-back mechanism: an excessive profit generated by a public subsidy is shared by the recipient with the public authority

Investors have developed several practical instruments to secure these key financial drivers

To secure beforehand or during the project, investors, and project promoters (sponsors) have developed a range of best practices for a better risk mitigation:

- **Cost per Home Passed:** they usually optimise the network design taking in consideration the exact topology and the cost saving opportunities. In addition, they set up agreements with contractors to better assess and control their deployment costs and delays.

- **ARPUs:** they set-up lease agreements with ISPs ensuring minimum ARPUs and minimum volumes over a long term, or IRU[14] agreements ensuring an immediate revenue flow.

- **Take-up rate:** they predetermine the potential fiber attractiveness in the area through surveys (typical threshold to start: 40%) and/or they co-invest with a well-established ISP which can provide brand equity, customer base, marketing and commercial capabilities.

Driver	Cost per Home passed	Take-up rate	ARPUs
Instruments	Engineering design + Contractor negotiation	Demand aggregation + Anchor tenant	Long term lease contracts + IRU agreements
Principle	• Optimal design based on the area topology, taking into account pavement coating and technical difficulties, presence of ducts, backbones… • Contractor negotiation to ensure workforce availability and pre-agreed prices	• Demand aggregation: predetermination of the potential attractiveness of fiber in the area (usually a threshold of 40% is a target before starting) • Anchor tenant: Co-investment with a service provider/ operator to get a minimum take-up	• Long term lease contracts: Commercial agreements with ISPs ensuring ARPUs & volumes over long-term • Indefeasible Right of Use: An ISP pays in one shot a full long-term access to the network *Note: IRU provides a significant funding to the project as well*

Figure 10. Instruments for securing financial drivers

Regarding the take-up rate, project promoters have also developed very **engaging sales processes**.

An engaging sales process developed by a project promoter

According to this project promoter, demand aggregation is not really adapted to rural areas, although it has been pushed by financial analysts (40% threshold). It is a risk mitigation measure for take up but could be seen as too risk-adverse, reducing the roll-out speed.

[14] IRU: Indefeasible Right of Use

The company has a different investment strategy: it prefers to start by promoting the network to the end-user with the support of local municipalities. Through general meetings one year before the first connection, it explains to end-users its model as wholesale operator, being not a service provider: end users only pay for the infrastructure, not for the service. During meetings, the company details the engagement process to the end-users:

- It invites end-users to sign asap an expression of interest for being connected.
- It sends a pro-format invoice to the end-user 3 months before the connection to the home,
- Only if the end-user pays the invoice, it connects the home to the network,
- After the completion of the connection, the end-user has 3 months to sign to an ISP,
- If the end-user does not sign to an ISP, it is charged a €200 financial compensation.

The pro-forma invoice for the connection represents about 20% of the net average wage. The promoter explains to end-users that they are buying a share of the network capacity and the in-house wiring that needs to be build (According to law, equipment that is physically linked to the house belongs to the house owner, like for electricity or for water). The promoter underlines that the fact that end-users pay for the connection has a positive impact on the perception of the service value but also generates less maintenance (as people care more when they own it).

Through this strategy (a pull from end users, rather than a push from the ISPs), the company managed to engage more end-users, prior to construction: from initial assessments of 15-20% interest, through promotion it reached close to 40% threshold. It requires to convince municipalities and to organize many meetings with local municipalities, supported by communication contractors. The project promoter globally estimates this promotion budget as 3% of CAPEX.

Projects' size and scaling potential are strong investment parameters, notably in debt

Project scale is an ultimate factor in the investment decision for major reasons:

- Scale provides **more capacity** to compete commercially with large players (e.g., incumbents),
- For a fruitful investment, it is an **opportunity to increase returns** through more CAPEX exposure,
- Each investment requires **a minimum effort** to analyze, to structure and to monitor it,
- Investors with large investment capacities want to **place big tickets**, not to be too dispersed.

Typically, investors consider that a project can be funded with 1/3 equity and 2/3 debt. However, the equity share can increase (or decrease) with the project risk level. For instance, **equity can go up to 100%** when the project is small and at a greenfield stage.

In the light of recent investments in the EU, we can split projects in 4 major size categories:

	Small projects	Mid-size projects	Large projects	Mega projects
Investment size	<€50m	€50m-€200m	€200m-€1bn	>€1bn
Eq. Home Passed[15]	20,000-100,000	100,000-200,000	200,000-500,000	>500,000
Equity share	100%	40-50%	30-40%	30-40%
Debt exposure	0	€20-€100m	€100m-€600m	>€600m

Figure 11. Typical FTTH project sizes

Equity investors are **very keen to invest at mid-size or more at a large size level**. When investing at a small or mid-size level, they look for a scale-up potential, either through more CAPEX in geographical extensions or by building a network platform that gradually consolidate new acquisitions. When the project has grown up, it is also easier for sponsors/equity investors to negotiate debt.

Large commercial banks and debt fund investors **usually want to place at least €100m** (up to more than €300m) where small debt players can have more modest tickets of around €20m.

Verbatims

- *"We look for projects with a large debt size of at least €200-300 million, up to several billions."*
- *"Our investment size starts from €50m-€100m but more often in the range of hundreds of millions."*
- *"We have systematically discarded small projects and consider projects with a critical size that allows a minimum €300m debt exposure, as each transaction requires the same level of effort for the teams and the same budget level to pay advisors, market studies..."*
- *"Projects need scale to be attractive to institutional investors, as each project requires a significant amount of preparatory work: a suitable debt requirement could be at least €100m over a total project investment of €200m."*
- *"It can invest with equity co-investors both financial and industrial and typically use a debt leverage from 50% to 80% of the investment with a typical interest rate of 2-3% p.a. Project size is generally from several hundreds of million Euros, up to 1.5 billion Euros."*

[15] Depending on CAPEX per HP: For instance, Spain can be around €500 and Germany around €2,000

c. Public stakeholders are considered as major project risk factors

Investors consider they can assess and monitor the major project risks with the mitigation instruments described previously. The major unsecured areas are more related to public authorities' actions: from local authorities processes to broadband subsidy schemes and regulation frameworks.

Local authorities are seen as triggers but also bottlenecks in project deployments

In a project deployment, **local authorities have a central role** as they give building permits and facilitate the access to public infrastructure (roads, ducts, public buildings, …). They can sometimes prepare and design a local project, and even organize tender calls for the construction and the exploitation of a municipal network by private companies. Some of them have even decided to construct and run themselves their own local municipal FTTH network.

Investors consider that they create **serious uncertainties** in project deployment (timing, costs, …) and can **increase dramatically competitive risks** by generating overbuild.

Investors have three major concerns:

- Small municipalities are often left alone to organize and/to decide on broadband projects and can be sometimes **under the influence** of incumbents or of local players.
- Administrative processes for building permits, roadwork authorizations, subsidy granting are in their hands, with usually **too much red tape[16] and delays**.
- Local laws and/or customs can make operations more costly and the BRCD[17] provisions are **not always well enforced** at local level.

Investors consider that **the pro-activity, the mobilization and the efficiency of local authorities** are a major success factor in project deployments. Some investors are active with municipalities at a very early stage of the project, and some have even invited local authorities to hold shares in their project.

Verbatims

- *"Regarding the roll-out process, local municipalities are not always very supportive and create administrative delays and extra cost in the deployment when it comes to right of way, building permits or road work management. Local administrations introduce also sometimes extra requirements that create costly negotiations for operators. Finally, municipalities can even expose a pure denial. The operator can then either delay or cancel the project. Although, in subsidy-supported projects, the operator can only cancel but can simply not delay the project."*
- *"Deployments often face heavy local bureaucracies creating administrative burden, notably regarding civil engineering, resulting in higher costs and project*

[16] Red tape: Excessive, rigid, or redundant bureaucracy
[17] BCRD: Broadband Cost Reduction Directive

slow-down (e.g., even if Telecom law accepts deployment at 40 cm under the ground, for some reason local public officers sometimes require 60 to 80 cm…).”

- *“Local laws create sometimes unnecessary costs. Some local digging practices cause higher cost (i.e., how deep you need to put the fiber, or mandatory cooperation with certain local providers to restore pavement, or to clean polluted grounds) where sometimes 50% of the building cost could be saved by using other practices.”*
- *“Red tape influences a lot the investment decision. Even when there is a strong official support at regional or local level, it can be difficult to get permits and authorities are sometimes reluctant to close roads as it is disruptive and expensive.”*

Subsidies are appreciated but also seen as potentially generating counter effects

Investors believe that subsidies are necessary to address market failures, notably in remote areas. Even though it depends on each country specific situation (competition, ARPU level, penetration rate, ...), investors usually consider a **€2,500 per HP threshold, as a limit to a potential project profitability**.

However, investors believe that subsidy schemes should be organized with great care to avoid market distortion effects for the major following reasons:

- When, in some countries, contractors’ skilled labour force is limited (fixed supply) and generates high construction prices, too widely spread subsidies create **a vicious circle** as it pushes up prices even more.
- Subsidies can be **unfair towards small players** who do not have teams and knowledge on how to claim them and how to use them properly.
- Subsidy level, calculation mode and granting process can sometimes be **wrongly designed** by public authorities.

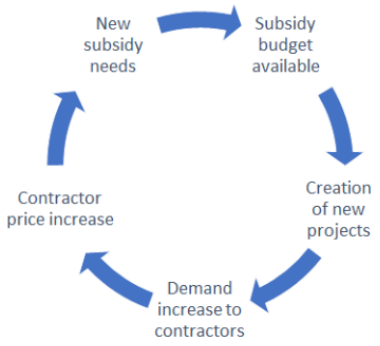


Figure 12. Subsidy vicious circle

In a nutshell, investors believe that thanks to the current large available market liquidities, most of the projects do not require any subsidy.

Some investors underline that other potential options targeting specific end-users could be more appropriate:

- End-users could be paying **an access fee** (e.g., €1,000+), representing the excess cost of their network connection beyond a given threshold. Access fee payment could be spread over some years and integrated to the monthly subscription fee (somewhat similar to operators’ mobile telephone subsidies). The rationale of making the end user pay is that fiber connectivity also increases the house value. It is a usual policy in countries like Sweden.

- End-users could receive **personal vouchers** (schemes have been developed in countries like Italy or Greece). They could also be directed to low-income households and/or to specific areas. However, it should be directed towards VHCN connectivity (to favour FTTH/fiber versus FTTC/copper) and be easy to manage (with a limited administrative burden).

Verbatims

- *"As a rule of thumb, a cost per home passed of around €2,000 in rural areas could be considered as a threshold for investment, but it depends on the situation."*
- *"In Germany, each mayor of a town of a few inhabitants decides locally, so it results in very small projects. This together with a protracted subsidy process (for less wealthy regions) increases the complexity which will impact the speed of the roll-out."*
- *"There has been so far a high administrative burden from using ESIF and we anticipate that it will be on-going with the project. In addition, we found it hard to make a business case in some very remote white areas, even when considering the subsidy of 75% that is offered by the programme."*
- "(In some rural areas), *we request to the customer a contribution to the higher CAPEX per home passed (around €3,000) through an upfront infrastructure fee of €1,500 per home, either payable at once or as a Euro 15 monthly add on. The level of these so called infra fee contributions depend on the Capex cost to build a particular expensive area."*
- *"Because they can make projects economically interesting, subsidies are usually necessary to ease financial stakeholders' engagement. To be efficient, this should be done through biddings, leveraging on private stakeholders' assessment of the public support need. A fixed subsidy can generate market distortion effects by increasing prices (as seen in the renewable energy market)."*
- *"Regarding subsidies, it is both an incentive and a disincentive because incumbents can also benefit from subsidies, and they often have the teams and expertise to obtain the subsidies with no chance for small grass roots operators to compete for them."*
- *"There is a voucher scheme available for end-users. However, up to date only 40% of these vouchers have been requested and 70% of them went to FTTC connectivity. The second phase should address the risk for vouchers not to be used for FTTH, despite the requirement from the Gigabit Society of a minimum 100Mbps."*

In the current land rush, regulation should prevent unfair practices and eviction tactics

Investors believe that incumbents, which operate a profitable fully amortized copper infrastructure, are currently facing **strategic dilemmas** and are tempted to delay the industry fiber transformation:

In short, they have the choice between migrating their customer to a new fiber infrastructure (but with a **less attractive product margin**) or **losing customers** captured by fibercos, as new entrants.

Incumbents have strong assets: they can leverage their large customer base, their image towards public authorities and customers and their large marketing and operational capabilities. Their **major resistance tactics** are (1) to strongly market alternative copper/FTTC offers (at lower speeds compared to fiber/FTTH) to the customer, (2) to show intentions to deploy fiber in some areas to stop or to delay potential alternative projects, (3)

to refuse to join other wholesale networks as an ISP (as to limit the wholesale network commercial attractiveness), (4) to carefully monitor other ISPs market share on its own wholesale network.

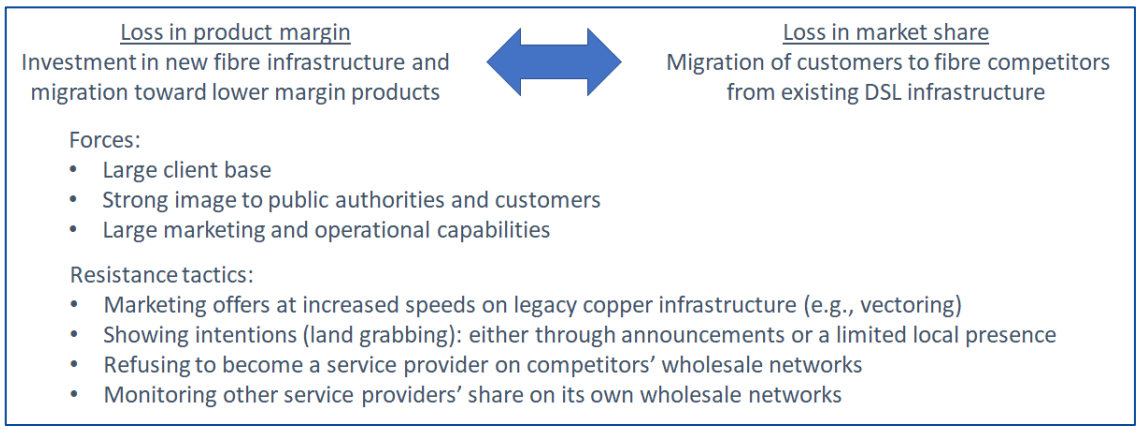


Figure 13. The incumbent dilemma

In some countries, 4G operators have similar strategies, as 4G broadband usage is mainly from home.

Investors believe that the current land rush, pushes incumbents (but also some other players) to develop unfair practices and eviction tactics and **call for regulation to prevent this from happening**:

- **"Planting the flag"** (land grabbing and/or overbuilding):
  - Some incumbents claim to municipalities that they commit 'soon', as to make them wait for them and refuse for some time any other alternative FTTH project.
  - Some deploy only in village centers ('low hanging fruit') and leave surroundings to spoil business cases of alternative FTTH projects targeting the whole area.

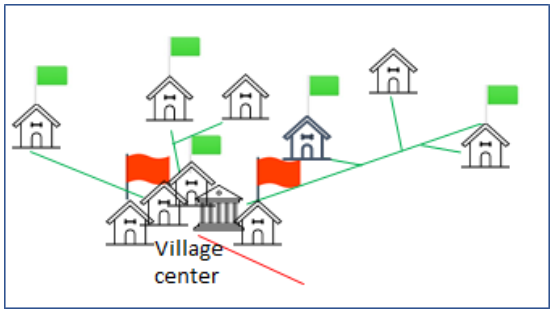


Figure 14. Village center deployment

- **"Engaging Sumo battles"** by throwing all its commercial weight (customer base, marketing capabilities, brand name, …) against any potential industry cooperative approach:
  - Some incumbents refuse to join an existing open access wholesale network in order to limit its potential marketing impact
  - Some players deploy additional networks against any economic rationality (overbuild) just to potentially disqualify an open access wholesale network

In a given local market, if player A has a significant market share in ADSL/VDSL (for example: 40+%), it can use it against an existing Open Access Network in a fight for FTTH market share.

Both will lose economically as none of them will fill its respective network at full capacity and after some time, one of them (possibly the Open Access Network, if there are return on investment expectations) could either give up or reduce its scope during the construction phase.

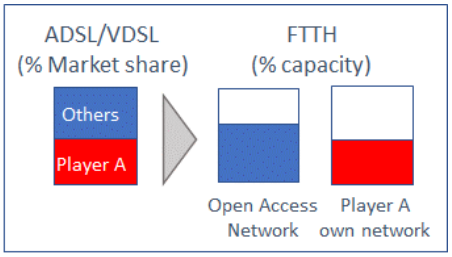


Figure 15. The Sumo battle

- **"Overpromising marketing"** by pretending or by suggesting to customers that VDSL/4G have similar speeds and QoS as FTTH, for a lower price. This kind of broadband advertising can create some confusion in customers mind and limit fiber attractiveness.

Investors believe that because of these practices, players tend to **disperse forces on many fields** and at the same time, **are unsecure** regarding the competitive environment on their whole footprint.

Investors would expect regulation to incentivise each player to focus on different areas and over the long-term to provide investment visibility. **Clear copper decommissioning milestones** could be an opportunity to accelerate the migration to fiber and to push incumbents to focus on priority areas. A **pro-fiber ADSL price regulation** could also reduce copper/FTTC broadband service attractiveness and therefore the risk of an "overpromising marketing".

Verbatims

- "(In Sweden), *there has been a fierce competition in the past years for land grabbing."*
- *"For a few years, we were often the sole company to propose FTTH roll-out in rural areas. New players are now entering the market. They approach municipalities but more for the sake of land grabbing, often without even any demand aggregation."*
- *"The incumbent is also increasingly promising to deploy projects to rural municipalities, even though it says publicly that it will focus on urban and suburban areas. Even if the incumbent does not need demand aggregation due to its customer base, it usually does not deliver the project as it has too much to do at country level. It is just a way to frighten a competitor with potential local overbuild that could spoil its project investment case."*
- *"The incumbent has refused to join our wholesale network as a service provider as in such case, it would lose a €30 margin per customer through the migration to fiber. The incumbent provides 250Mbps in FTTC and is looking for investing on FTTH … but only when there will be demand for 1Gbps."*
- *"Major barriers to the investment come usually from incumbents promoting alternative services from their legacy networks, which ultimately delay FTTH take-off and investment payback."*

- *"In an Open Network model, there is also a risk that incumbent operators refuse to join as service providers and therefore spoil the project financial perspective, so that finally the Open Network goes bankrupt."*
- *"The incumbent is often reluctant to invest early-on in fiber as it wants to protect its own ADSL/VDSL revenue and tries also to prevent or to slow down competitors' investments through land grabbing tactics."*
- *"The best financial approach for the project holder is to have on-going revenues while preparing further extensions in different waves of construction. But it is also important to make a proper densification and unfortunately some project holders often want to do "land grabbing". They want to be the first mover, connect a few homes, and pledge they will cover new areas, whilst they do not finish the areas they started. As banker, we see a risk in strategies that privilege land grabbing to penetration rate."*
- *"Regarding competition, the stability and predictability of wholesale price regulation is key. When the wholesale prices are high enough, it gives more space to new entrants."*

d. Except for smart cities, 5G deployment is not today in investors' radar

Investors are following 5G recent deployments in the EU and projects around smart cities.

There is overall a strong scepticism about 5G in rural areas in a near future

Investors are sceptical about 5G in rural areas, except for FWA as a last mile complement to fiber:

- They see for now 5G as **a "smart city" topic** with the potential development of small cells and DAS infrastructures. Although they are unsure about the potential business models and their engagement in these projects.
- They believe that 5G, besides its increased network capacity, is more designed **for industrial applications**, which are *de facto* more limited in rural areas.
- As opposed to fiber, they question the "future-proof" character of 5G. They underline the **perspective of 6G in the next 10 years** that would potentially undervalue the 5G assets.
- They note that 5G slicing could be an opportunity to reduce mobile infrastructure costs between operators and some of them consider potential 5G rural open host business models.
- They recognize that 5G could be a solution to provide (1) last mile connectivity through FWA on an FTTH network (2) connectivity in some remote areas instead of FTTH. Although, some investors analyze that considering the current FTTH rollouts and the strong public financial support, there is a chance that fiber arrives before 5G in remote areas.

5G is not today a key topic for investors for now but it could be in the next 2-3 years.

Verbatims

- *"For 5G, in the financial community, as for now there is a limited competence and limited understanding of its potential. There could be an urgency to build 5G in dense areas but in rural areas, it will be less compelling for investors. When 5G networks will be rolled out, many more lessons will be learned. There could potentially be a need for subsidies to help or facilitate certain investors to get acceptable IRRs."*
- *"Regarding mobile, in some area, towers are now too numerous, and operators are sharing sites. Tower companies have now reached very high valuations through a large consolidation and as for now, it will be difficult to scale in the tower space. So, Macquarie has discarded this type of investment but 5G mobile infrastructure could soon be interesting if MNOs decide to sell and share their 5G infrastructure. In such case, the challenge will be to design the right framework that would be running a portfolio of thousands of small antennas."*
- *"Regarding 5G roll-out in rural areas, independent 5G open access models could appear but there are many ways of sharing infrastructures, from site sharing to RAN sharing, and finally complete wholesale models... Although, as of today, the main driver for 5G in more in urban areas and around industrial applications, so the deployment of 5G in rural areas is definitively not a priority for Telcos."*
- *"For now, investors do not see 5G use cases [in rural areas]. It will not be a competitor but more a complement to fiber and will leverage the installed fiber infrastructure capabilities."*
- *"Regarding 5G, there are question marks about its sustainability (after 5G, there will be 6G, 7G,…). A second issue for investing on 5G is the market need. Besides urban zones and smart cities, should it be introduced in rural zones and for what? Which complementarity/substitution with fibre? Investors consider the 5G market as a long-term opportunity (5-10 years) in which fibre could bring connectivity."*
- *"5G could provide an alternative to fiber but fiber will probably be deployed before 5G in rural areas. In addition, significant speeds in 5G will require millimeter waves and therefore a high antenna density that will increase mobile network investment costs." "Regarding 5G in rural areas, we believe that for now the business model is not that clear. Probably, towercos will be quite active but there could be some opportunities for infrastructure funds."*
- *"5G technology provides slicing capabilities that could be useful for deploying a full infrastructure sharing without any roaming, notably in rural areas. With an adapted legislative framework, regulators could foster 5G network roll-out in rural areas through a wholesale approach leveraging slicing as a capability. The cost attractiveness of this kind of deployment also depends on the availability and on the price of low band frequencies such as 700 MHz."*

Despite towercos' strong interest, 5G deployment mainly depends today on MNOs

For now, 5G deployment only depends on MNOs:

- Frequencies are **solely in the hands of MNOs**. Although, Germany has also provided frequencies to industrial companies for private 5G networks.
- **Coverage regulations are strong** and sometimes backed by "new deal" licenses.

- MNOs are increasingly **moving towards Open RAN sharing** (e.g., Deutsche Telekom, Orange, Telefonica, TIM and Vodafone through the O-RAN alliance[18])
- **Towercos will wait for MNOs** to move forward before building new towers

Investors note that the towerco approach of **5G open host** (similarly to FTTH open network) has recently emerged. This approach could also leverage 5G slicing. During the workshop organised for this study, Cellnex mentioned that it was ready to provide 5G open hosting, notably in rural areas. After the recent Polkomtel acquisition, Cellnex has already such operations active in Poland.

5G open hosting would **decrease deployment costs both for mobile and FWA purposes**, through the sharing, up to the active layer (spectrum), of tower and radio equipment. This move towards the active layer will expose towercos to telecom regulation, which is not the case for passive equipment.

Verbatims

- *"We provide connectivity infrastructure to operators and potentially some additional coverage (in cities, in stadiums, in corridors…) but we have no ambition to provide the full service."*
- *"Mobile open hosting is developing in large cities in Europe. In rural areas, we could also provide a low cost and efficient solution for local communities. We could move towards running fiber (horizontal and/or vertical fibre on the tower)."*
- *"Requests come from MNOs, even though we try to anticipate these deployments. We rarely build towers beforehand. Local communities could restrict the number of towers in an area, to push MNOs towards developing RAN sharing infrastructure. RAN-as-a-service players will probably emerge to provide it to MNOs."*
- *"As for now, the market is more demand-driven (from operators): 5G densification, coverage obligations and new entrants. The long-term objective is to build sites where there is some demand and not only supply."*
- *"We believe that this demand-driven market will soon flip, and the new coverage obligations is an opportunity for that. The issue for the European mobile market has always been fragmentation (200 operators). The tower industry will change, and it is a good opportunity for the EU to get more consolidation in an area of the industry that is the most capital-intensive part of mobile networks. Anything that can support that move will create a single mobile network in Europe."*
- *"We have always been operating in a non-regulated space (passive infrastructure) which is a nice "sweet spot" for investors, but we could also study the opportunity to invest in active technology at some point (possibly in Open RAN)."*
- *"On towers, the infrastructure has been split between the physical asset and the active component, which have a different lifetime and a different risk profile. Some towercos are also moving to netcos, managing active components of the network to fasten the deployment of small cells antennas for 5G connectivity. 5G will be an opportunity for independent players to provide small cells networks as a service in urban areas inside and outside buildings as it is unlikely that each operator will roll-out its network everywhere."*

[18] https://www.o-ran.org/ecosystem

- *"For towers, the wholesale passive infrastructures should also be integrating the active layer. It is already the case for fibrecos and some towercos are also moving towards that. In the context of a towercos sector consolidation, there will be a need for differentiation between players that will probably trigger a move toward active layer."*

4. INVESTORS' PROFILES AND INVESTMENT SECTOR DYNAMICS

Investors can be classified upon 4 major categories:

- Equity Investors: infrastructure funds, private equity funds, NPBIs, …
- Money Lenders: commercial banks, debt funds, NPBIs, …
- Institutional Investors: pension funds, insurance companies, …
- Project Sponsors: start-ups, operators, fibrecos, towercos, …

a. Equity investors provide the riskiest share of the funding

Equity investors are key project stakeholders, providing the required capital and taking most of the risk for a given project. Equity investors are usually very close to sponsors, up to sometimes integrating them and literally becoming managers of the project.

An infrastructure project lifetime sees different types of equity investors

Usual consideration in an infrastructure project is 20+ years, which is typically split into 2 major phases:

- The 'construction/first revenues' phase
- The 'full operation' phase

A project with extensions can have different successive construction phases/operation phases. These 2 phases see different types of equity investors:

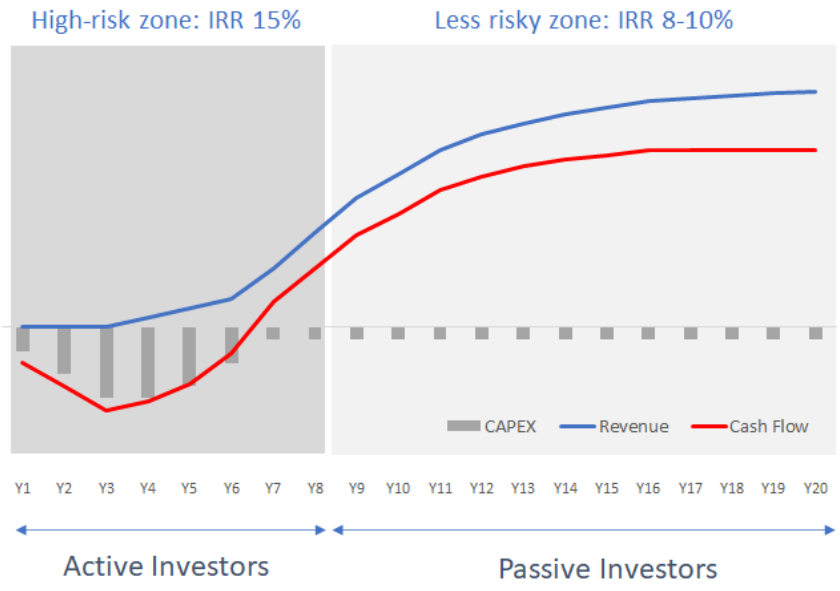


Figure 16. Two equity investor types

1st phase (up to 7-8 years): Active investors

Typically, infrastructure funds that de-risk the investment by supporting (1) the construction, and (2) the generation of the first revenues. They have an active ownership (50+% stake) and look for selling after 7-10 years with capital gains. In this high-risk zone, **expected IRR is 15+% p.a**.

2nd phase (after 7-8 years): Passive investors

Typically, pension funds or insurance companies that expect regular and stable/growing cash yields over a long-term horizon (20+ years). They have a passive ownership as minority shareholders. In this less risky zone, **expected IRR is 8-10% p.a**.

At the end of the first phase, active investors **sell their shares to passive investors and strategic investors** (such as telecom operators, fibrecos or towercos). Even if its personal horizon can be at a shorter term, the active equity investor consideration is always long-term as he wants the next investor to come with the best risk-return perspectives in order to maximize its own return.

Position of active investors

- *"We invest with money from institutional investors such as pension funds that have expectations on the IRR level they would get after 8 to 10 years. We are an active investor while pension funds are called passive investors. The key issue is not to get funding from pension funds but to build the business case that assures the required returns. FTTH can be a very attractive market for investors as it will*

be an essential infrastructure for the next 50 years generating a recurring stable cash flow, potentially growing with inflation."

- *"The objective is to build these networks in a very operational mode with the right quality, at the right time, with the right equipment, with the right quantity of connections, … Once built and running, they will be perfect assets for institutional and/or strategic investors. We target natural monopolies in rural areas (that would potentially become regulated at some point in time), which could be later perfect assets for a passive financial investor."*

Although, the current investment appetite **has blurred the lines between these investor types**. Traditional active investors, such as infrastructure funds, are now ready to stay longer while traditional passive investors, such as pensions funds or insurance companies, are ready to come earlier.

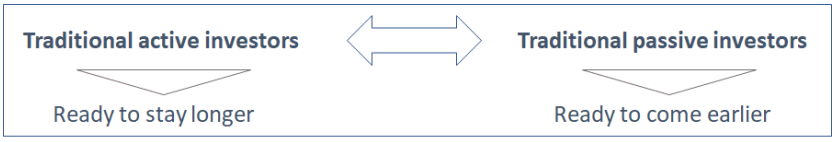


Figure 17. Blurred lines between the equity investor types

There is a significant level of funds, directly available for digital infrastructures (see fig.18)

As of today, there are only about 25 equity investment companies, really active in European broadband projects: 5 are run by institutional investors and about 20 by infrastructure equity funds.

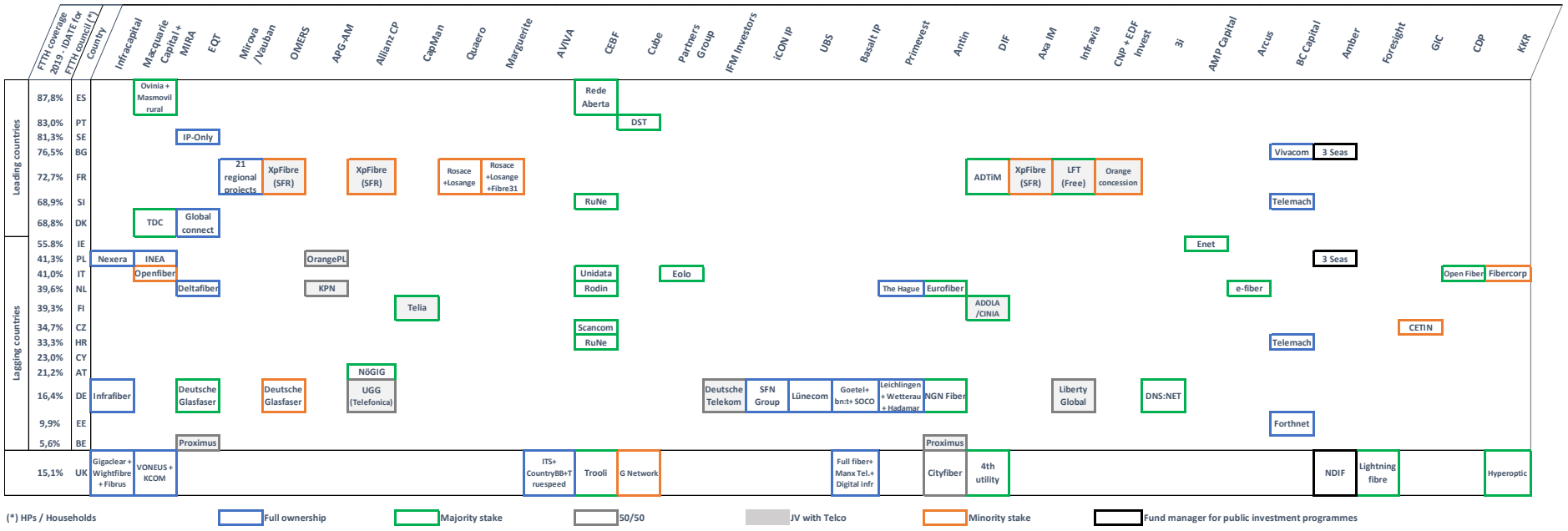
For the equity fund part solely, it represents **a total available amount estimated at €50+bn**.

Some investors have a **"cash yield" profile** (expecting regular flows over a long period of time), others have an **"appreciation" profile** (expecting capital gains through an increase of the asset value). Finally, some investors have **a "total return" profile** (expecting cash yield + capital gains).

	Company	Active funds/ platforms	Fund size
Institutional investors	OMERS	OMERS Plan	C$22bn
	APG-AM	APG Pension Plan	€10bn (est.)
	Allianz Capital Partners	Allianz Equity Fund (AGDIEF)	€900m
	AVIVA	AVIVA Equity fund	£37bn (real assets)
	Axa Investment Managers	Axa IM Real Assets	n.a
Infrastructure equity funds	BC Partners	BC Partner X	€10bn
	EQT	EQT Infrastructure Fund V	€15.7bn
	Antin Infrastructure Partners	Antin Infrastructure Partners IV	€6.5bn
	Ardian	Ardian Infrastructure V	6.1bn
	Macquarie Capital + MIRA	MEIF VI (MIRA)	€6bn
	Amber Infrastructure	3 Seas Initiative Investment Fund	€3-5bn (target)
	Vauban IP	Vauban IP / CIF III	€2.5bn
	Infravia capital partners	InfraVia IV	€2bn
	Arcus Infrastructure	AEIF 2	€1.2bn
	DIF Capital Partners	DIF CIF II	€1bn
	Infracapital - M&G	Infracapital Greenfield Infra Fund II	€1bn
	Cube Infrastructure	Cube Infrastructure Fund II	€1bn
	Marguerite	Marguerite II	€700m
	Quaero Capital	QEIF II	€600m
	Primevest	Primevest Communication Infrastructure Fund	€600m
	CEBF	CEBF	€550m
	Eurazeo	EIP1 (funding round)	€500m (target)
	CapMan Infra	Capman Nordic Infrastructure Fund I	€190m
	3i	3i Infrastructure plc ("3iN")	Listed

Sources: Infrastructure Investor, Inframation

Figure 18. Major equity investors active in EU broadband projects



Source: Infrastructure Investor, Inframation

Figure 19. Recent equity investment operations

Recent FTTH equity investment operations cover a large part of the EU (see fig.19)

In the last years, investors have focused on the most lagging EU countries: Germany, The Netherlands, Poland, Finland… and are also quite active in the UK.

Most of them are run with a full ownership or a majority stake, demonstrating the willingness of investors to be active. The rest is mainly about cooperation / JVs with Telcos where the investor still has a strong co-driving role.

It is worth noting the Amber Infrastructure position as a fund manager for public investment programmes (NDIF in the UK and the 3 Seas Investment Fund in the CEE).

To mitigate deployment risks, active investors have developed partnership strategies

To reduce uncertainties and potential risks when executing projects, investors look for **the most relevant partner** depending on the project development case.

A greenfield project mainly requires a **deep construction knowledge** -that can be provided by an industrial company- to meet costs and delays. Investors also develop sales contracts with ISPs.

A brownfield project (+ extension) must rely on a **skilled operational team** with a business expertise and a deep market knowledge. At a larger scale, investors partner with **large telcos, as anchor tenants**. They provide their brand, customer base and established commercial capabilities.

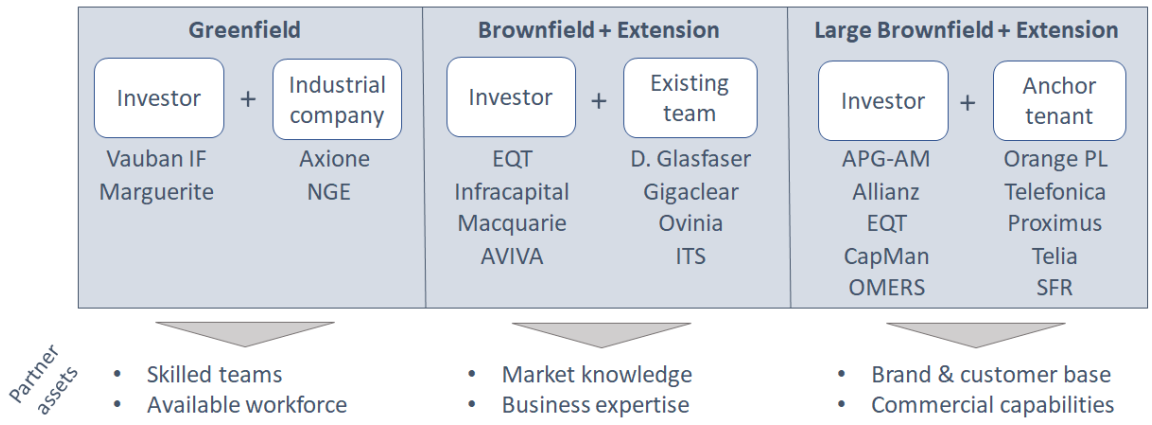


Figure 20. Investors' partnership strategies

In Western Europe, many partnerships have been developed in the last years and now independent local partners are less and less numerous. It may come as an issue regarding European deployment capabilities, as it may concentrate investment in the same hands.

Verbatims

- *"We support the development of nationwide fiber roll-out programs with national champions acting as "anchor tenants" that widely market the service through independent JVs on an open access wholesale model".*
- *"In 2020 we have created a JV with a Telco (60%/40%). The JV was finally transformed into one of the largest independent Open Access FTTH network operators in the country."*
- *"We have 2 potential business approaches: (1)With an industrial partner, as first mover in rural areas to roll over FTTH networks (greenfield projects); (2) With an operator looking for a financing partner (cash + LT investment), in brownfield projects, with offtake agreements."*
- *"Our investment model is based on the acquisition of existing and already operational infrastructure with the objective to ramp up the current business. After the investment, we are active in the management, hiring the team and sometimes even creating the brand image."*

b. Project lending relies on 4 major products depending on the risk level

In a digital infrastructure project, debt represents up to 80% of the funding.

The riskiest projects (e.g., construction phase on a greenfield) are financed through commercial loans that include **a refinancing after 5 to 7 years**: the so-called *"hard mini perm*[19]*"* financing obliges, and the *"soft mini perm"* financing incentivizes the sponsor to refinance. There are usually very strong covenants to monitor the risk.

The reason is that commercial banks provide **a short-term service to structure and to finance the start of the project** but do not want to stay exposed to the project risk over the long term. Although, some banks can provide project finance loans (up to 25 years) when project risks are safely secured. Interest rates are floating, representing 300-400 base points (in current financial markets conditions around 3-4%). Sponsors mitigate the interest rate risk by acquiring interest hedging instruments.

[19] Mini perm is a type of short-term financing traditionally operated in real estate. It is used to pay off income-producing construction or commercial properties. "Perm" alludes to traditional permanent financing, which, in the case of the mini perm, the borrower has not yet been able to secure. Mini perm financing is something a developer would use until a project has been completed and can start producing income. *(Source: Investopedia.com)*

	Commercial banks		Institutional investors	
	Short term loans	Project finance loans	Debt Funds	Bonds
Maturity	7 years	15 to 25 years	Long term (15+ yrs) - Variable	Long term (15+ yrs) - Variable
Description	Hard mini-perm: refinancing mandatory before 7 years	Soft mini-perm: refinancing encouraged after 5 years	Standard products	Issued on public markets
Advantages	Customized structuring service approach		Large potential debt volumes Secondary market for loans	Primary bond market + Secondary bond market
Drawbacks	Covenants – Refinancing in the short run		Simple products	Rating *(investment grade)*
Interest rates	3-4%		1-3%	

Risk level

Figure 21. The 4 major debt products

The less risky projects (e.g., operation phase on greenfield, brownfield with extension, …) can be financed by **debt funds with a long-term maturity (15+ years)**. These products are usual and quite standardized and can be traded on a secondary market. Interest rates can be floating (around 200 base points, i.e., today around 2%) or even fixed, which eliminates the interest rate risk.

Large and secure projects can be financed through bonds. Bonds must be considered as *investment grade* by rating agencies, before being issued on public stock markets. They can also be traded on secondary markets. Until now, they have not been so common in FTTH projects (although, some examples for towercos). They **could soon be hype** with the development of larger scale projects.

Banks are instrumental to structure projects before other players follow

According to Alessandro Merlo, head of the Infrastructure Debt of UBS Asset Management, *"The European Infrastructure debt market totals around €120 billion of financing every year. **Around 80% of that is still done by banks**, leaving only around 20% for institutional investors"* (source: Infrastructure Investor March 2021).

Projects financed by loans usually have a refinancing zone between 5 to 8 years after the start of the project, either mandatory (hard mini perm) or encouraged (soft mini perm).

To incentivize sponsors to refinance, the typical soft mini perm conditions are:

- Rate margins increase overtime
- Cash sweep (all cash in excess goes immediately to debt reimbursement)

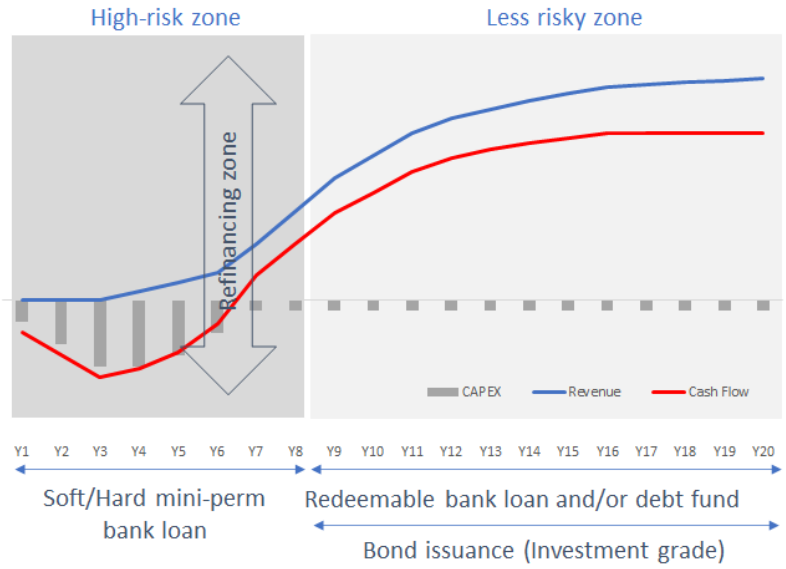


Figure 22. Debt financing phases

- Commercial banks can also **syndicate loans and privately place debt** to infrastructure funds and to institutional investors.
- Projects can also be financed through **"bullet loans"**[20] (often over 10 years)
- The refinancing period is also an opportunity for project sponsors to **increase the Debt / Equity gearing ratio** (more debt in proportion of equity) and thus the RoE[21]
- Redeemable bank loans and/or debt funds are the most common financing while bond issuance requires a significant size and **steady cashflows**.

The EU regulation framework incentivizes banks to lend over the long-term (15+ years) despite the risk taken and the cost of capital requirements. It is a specific provision called the ***"infrastructure supporting factor"*** in the CRR2 regulation[22] that **reduces by -25%** the cost of capital requirements for banks in the case of long-term projects.

This has a positive impact on the availability and the conditions for financing. In order to pursue with this positive approach, bankers would expect the future Basel IV regulation to meet Solvency II's similar regulation for insurance companies at -35%.

[20] Bullet loan: capital is fully reimbursed at its maturity. During the project, only interests are paid.
[21] RoE: Return on Equity (net income over shareholders' equity)
[22] https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/100427

Lending processes require a strong risk assessment and a tight monitoring control

Commercial banks have clearly defined processes backed by strong analytics, where they scan and structure the case and provide the framework for the loan agreement, including some monitoring tools in the execution defining how and when the money will be released to the sponsors.

A central parameter in the bank credit decision is the **"replacement scenario"** that considers what could happen if the project cannot be pursued: reduction of scope, network sale, merger, …

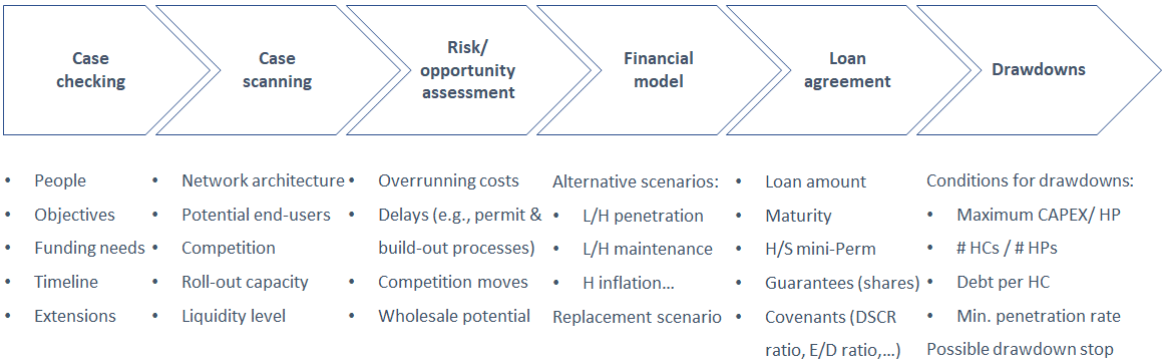


Figure 23. Typical bank loan process phases

The major focus of the bank is to secure the project risk, first by identifying and evaluating each component and then by **carefully controlling the execution through the "conditions for drawdowns"**.

When the project goes in the wrong direction and that debt reimbursement is difficult, there is always room for discussion between lenders and sponsors, up to a potential rearrangement of the debt.

The bank is remunerated through the interests (at 3-4% p.a.) **but mainly through the structuring service fee**, usually largely differed to the refinancing phase.

The 15 most active banks account for €25+bn cumulated loans for FTTH

Commercial banks have been very active in FTTH project funding and the 15 most active have already supported more than 250 projects with an average debt exposure of **€100m per project**.

Although some large international banking institutions are leading (such as Société Générale, Santander and Credit Agricole), it is worth noting that other institutions (such as HSBC) are not really represented.

Mid-size national banks (such as NIBC Bank NV, Kommunalcredit Austria or Caisse d'Epargne) can be far more visible, usually leveraging broadband projects in their home countries.

	Amount (USD)	Projects
Société Générale	4,322m	41
Santander	2,780m	27
Credit Agricole	2,501m	25
ING Group	2,589m	24
Natixis	2,008m	22
BNP Paribas	2,643m	19
Natwest Group	1,679m	14
NIBC Bank NV	705m	12
Caisse d'Epargne	565m	12
Kommunalkredit Austria	763m	11
ABN Amro	1,199m	11
Hamburg Commercial Bank	620m	9
Skandinaviska Enskilda Banken	995m	9
Deutsche Bank	1,787m	8
DNB	568m	8

Figure 24. Loans for fixed line, Europe
(Source: *Inframation deals* website)

c. Debt funds and institutional investors are increasingly active in this market

As part of their long-term liability matching approach, institutional investors (insurance companies, pension funds) look for placements generating safe and regular yields over the long term. They diversify their investments on various asset classes (bond market, private debt, real assets, …) and have recently developed **a strong interest for telecom infrastructure** which provide them a long-term positive perspective of stable inflation-sensitive yields with a low risk level

In the last 10 years, mainly due to Central Banks expansionary policies, financial markets have been massively fueled by liquidities, that have notably **flown into debt investment funds**.

Debt funds are competing with banks but also providing them credit to back their financing

According to *Infrastructure Investor*[23], the 20 first largest infrastructure debt fund players have raised from January 1st, 2015 to August 31st, 2020 **an amount close to €100bn**.

Debt funds usually provide long term credit (20+ years) but market reality with short term bank loans pushes them towards **short term debt (<10 years)**.

They consider that an unlisted investment should be **at a higher interest yield** than to a similar-risk public market bond investment. Typical expectations are: 200-250 bps for investment grade and 350-600 bps for high yield.

They expect sponsors to fully respect their commitments. As opposed to banks, debt funds **do not provide any room for credit rearrangement and impose credit penalties**. Compared to banks, financing is more long term with fixed rates that could look **more attractive** since they eliminate interest hedging costs.

Rank	Manager	Headquarters	Capital raised ($m)
1	AXA Investment Managers - Real Assets	Paris	14,425
2	BlackRock	New York	13,230
3	EIG Global Energy Partners	Washington DC	12,440
4	Macquarie Infrastructure and Real Assets	London	8,872
5	Allianz Global Investors	Frankfurt	8,156
6	AMP Capital	Sydney	7,334
7	Westbourne Capital	Melbourne	7,169
8	Global Infrastructure Partners	New York	5,544
9	Rivage Investment	Paris	5,108
10	IFM Investors	Melbourne	3,848
11	Edmond de Rothschild Asset Management UK	London	3,464
12	Brookfield Asset Management	Toronto	3,105
13	The Carlyle Group	New York	2,935
14	Schroder Aida	London	2,717
15	HSBC Global Asset Management	London	2,481
16	UBS Asset Management	Zurich	2,276
17	La Banque Postale Asset Management	Paris	1,660
18	Vantage Infrastructure	London	1,587
19	RGREEN INVEST	Paris	1,425
20	SCOR Investment Partners	Paris	1,216

Figure 25. Major global infrastructure debt funds
Capital raised between 1 Jan 2015 and 31 August 2020
(Source *Infrastructure Investor*, March 2021)

Debt funds do not only directly intervene with sponsors; they also **participate in banks' project financing** by providing credits covering a share of the operation through a project banking syndication.

[23] https://www.infrastructureinvestor.com/meet-the-top-20-infra-debt-fundraisers/

The current trend for IRU financing in projects will potentially reduce debt funds operations

Indefeasible Rights of Use (IRU) contracts with Operators/ISPs have been gaining popularity in projects, first as **a way to tight-in commercial agreements** over the long-term with ISPs and as an **immediate source of cash** for the project. IRU also secures network availability and access prices over the long-term to ISPs. Typically, price levels can be set over 20 years or more.

IRU is also good news for:

- project sponsors that can better monitor cash needs (construction costs, take-up delays…)
- equity investors that can get dividends earlier
- banks that have a source for refinancing the initial credit after 5 to 7 years (mini perm)

Although, IRU is **far less appreciated by institutional investors** when they invest in debt, as IRU reduces the forecasted revenue stream (for the part paid through IRU by interested operators) and gives opportunities to other financial stakeholders to be served more easily. In a nutshell, with IRUs, institutional investors have an increased long-term commercial risk and less advantages than others. This situation could disincentivize institutional investors to provide debt or with less attractive conditions, except if they find ways to better monitor the use of IRU within the project.

Verbatims

- *"IRUs have destabilized project financial models as opportunities for equity investors to get some early dividends and for bankers to quickly get the credit repaid. For debt investors, when the cash provided by IRUs has been largely used, it reduces the recurring cash flows level backing their long-term financing, and it still exposes them to the risks of the exploitation phase."*
- *"Debt funds generally do not appreciate potential risk discrepancies with equity investors, notably in the case of IRUs that give an opportunity to equity investors for some early dividends. Recently, the proportion of IRU (as opposed to lease) has increased and debt funds (but also banks) try to propose contractual ways to ensure that the available cash does not go too quickly to equity investors."*

Eager to place liquidities, a few institutional investors invest directly and bypass asset managers

In a traditional approach, institutional investors (LPs[24]) invest in equity or debt infrastructure funds, run by asset managers (GPs[25]) and these funds invest themselves in projects.

[24] LP: Limited Partners
[25] GP: General Partners

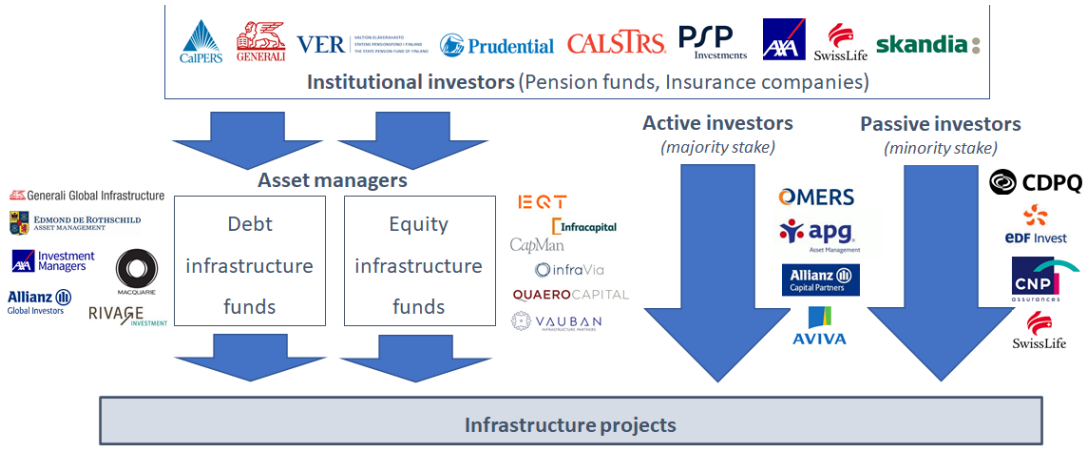


Figure 26. Institutional investors channels for reaching projects

Although, some institutional investors have taken a direct investment role in projects, possibly through internal asset management structures. Some of them even take an active leading role. It looks attractive to them as they could directly **expose more money** and have **a direct project control**.

However, this approach is still rare, as **it requires skilled and dedicated teams**, not only to invest but also to monitor projects on a daily basis.

d. NPBIs have a very variable exposure to broadband investments

"National Promotional Banks and Institutions (NPBIs) are legal entities carrying out financial, development and promotional activities on a professional basis, which are given a mandate by a Member State at central, regional or local level." (Source: EIB website[26]).

EU NPBIs have various financing tools from Equity to Debt and Guarantees. Several of them have taken initiatives at national level regarding broadband funding but **with a variable intensity**.

		Equity				Debt	Guarantee	Examples of support to broadband
		Marguerite	CEBF	3 Seas	Other			
EIB	EU	✓	✓		✓	✓	✓	Direct/Interm. loans (€2.5bn '19), EFSI products, Project bonds
BDB	BG			✓	×	✓	×	2 loans to Telecom centers. One pillar of the 3 Seas Initiative
BGK	PL	✓		✓	×	✓	×	Commercial loans or loans granted with special conditions. One pillar of the 3 Seas Initiative.
CDC	FR	✓	✓		✓	✓	×	Since about 15 years, €415m in equity and €815m in loans on regional FTTH projects
CDP	IT	✓	✓		✓	✓	✓	Investment in and loans to Open Fiber Loan guarantee to Linkem
HBOR	HR			✓	×	✓	×	Support to other types of infrastructure (in debt only)
ICO	SP	✓			×	✓	×	Loan to Cellnex Telecom in 2017 (€100m)
KfW	DE	✓	✓		×	✓	×	2 large loans programmes with BMVI for local projects KfW-IPEX : Support to large private projects in debt (FR, DE)
NIB	Nordics				×	✓	×	Credit financing in Norway + Debt to large Telcos (Tele2, Elisa,...)

[26] https://www.eib.org/en/about/partners/npbis/index.htm

Figure 27. Profiles of EIB and 8 NPBIs

NPBIs are also active in pan-European initiatives, such as:

- **EFSI**[27]: Cooperation with EIB in the roll-out of the Juncker Plan and distribution of EFSI products.
- **Marguerite fund**[28]: An equity fund acting as a catalyst for infrastructure investments implementing key EU policies in the areas of climate change, energy security, digital agenda and trans-EU networks. It is managed by Marguerite SA.
- **CEBF**[29]: An equity fund investing in open access networks to improve mobility, boost services and build thriving communities. It is managed by Cube Infrastructure.
- **3 Seas Initiative Investment Fund**[30]: An investment vehicle to finance key infrastructure projects in the Three Seas Region (CEE). It is managed by Amber Infrastructure.

Debt is the **most common investment tool** for NPBIs, except for *Casa di Depositi e Prestiti* (IT). Debt can be oriented towards broadband project promoters, large operators or even municipalities.

Equity is mostly used through **pan-European initiatives** (Marguerite, CEBF, 3 Seas). The *Caisse des Dépôts et Consignations* (FR) is the sole player to have a strong involvement in equity investments at national level (together with debt products).

The discrepancies in financing tools and involvements between NPBIs are clearly calling **for more experience and knowledge sharing** amongst them, regarding support to broadband deployment.

e. Industrial investors leverage very favorable financing conditions

Industrial (non-financial) investors can be split in two categories:

- Strategic investors (large companies such as telcos, fibrecos, towercos)
- Entrepreneurs (usually at start-up and scale-up stage).

Strategic investors reach out public and private markets and raise massive funding

Large companies with significant and steady cash flows can take advantage of financial markets and institutional investors that provide large funding capabilities.

[27] https://www.eif.org/what_we_do/efsi/
[28] https://www.marguerite.com/about-us/background/
[29] https://www.cebfund.eu/
[30] https://3siif.eu/the-fund

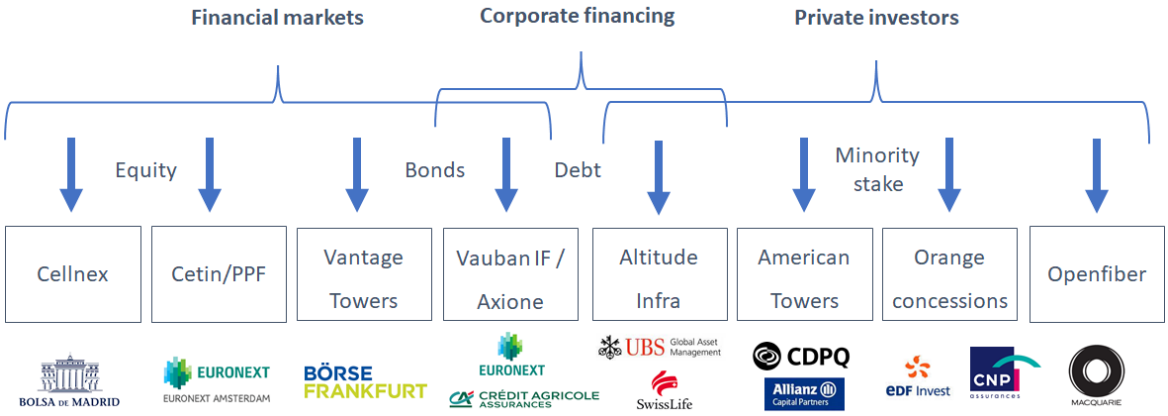


Figure 28. Financing options for strategic investors

Regarding **public markets**, financing can be:

- **In equity** like Cellnex increasing its share capital by €7bn in March 2021[31] or like Cetin / PPF considering an IPO for its Telecom Unit[32]
- **In debt** like Vantage Towers with a €2.2bn bond issue in March 2021[33] or like Axione launching the first European project bond of €189m in 2014[34]

Regarding **private markets**, financing can be:

- **In equity** by selling a minority stake such as American Towers (CDPQ: €1.6bn), Orange Concessions (EDF Invest and CNP: €1.35bn), Open Fiber (Macquarie: €2.65bn) and Altitude Infra (Swisslife: €350m) in 2021
- **In debt** with a mixed financing (€500m) of equity and junior debt like Altitude Infra with UBS[35]

These financing operations are set at a corporate level, building on **already strong balance sheets**.

Entrepreneurs are still facing high barriers to start but also to scale in the market

Even without a clear list, there are probably **less than 50 entrepreneurs in the EU,** mainly on small scale projects (20,000-100,000 HPs).

Although, some countries have mini-project promoters (even on a street-by-street basis) supported by local banks: 700 projects in Bulgaria. Countries like Germany, France and the Benelux are **very difficult to enter** for small greenfield projects.

[31] https://www.reuters.com/article/us-cellnex-equity-idUSKBN2BM0IE
[32] https://www.nasdaq.com/articles/czech-billionaire-kellners-ppf-considers-ipo-for-telecom-unit-cetin-2021-02-16
[33] https://www.pressetext.com/news/20210330037
[34] https://ec.europa.eu/commission/presscorner/detail/en/BEI_14_173
[35] https://capitalfinance.lesechos.fr/deals/capital-developpement/ubs-am-mise-500-m-dans-altitude-infrastructure-1243029

Starting a large-scale project from scratch is **a long and heavy process** requiring:

- Demonstrated engineering and business skills
- A minimum capital and often a “sponsor” (local entrepreneur or bank)
- Time to negotiate with banks and investors
- Knowledge and skilled teams to claim for subsidies

At an early stage, entrepreneurs usually cannot find neither banks (too risky), nor investors (too small) to finance their broadband projects.

The objective of the Connecting Europe Broadband Fund (CEBF) is to address this financing gap. It has been providing a strong support to entrepreneurs, with as-of-today assessing 140 early-stage projects and **funding 8 projects since 2018**, each by a €30m equity stake.

CEBF has a network of senior advisors with a deep knowledge of local markets to originate projects. Although, as of today, this network covers mainly the western part of the EU.

Funding is based on **a “sweat equity” approach**, where the entrepreneur devotes its time and energy in exchange of a share of capital. Equity is released by CEBF when milestones are reached.

Figure 29. CEBF 2018-2020
140 projects assessed – 8 funded

At a later stage, CEBF targets to handover projects to banks and to equity investors.

In this booming market, besides the success of CEBF, there is a clear need to foster entrepreneurship up to a moment when it could be supported by international investors. This would require **a complete scalable end-to-end accelerator process** from public authorities.

5. COVID-19 IMPACT ON INVESTMENT IN BROADBAND GIGABIT

The health-related aspect of this crisis, which has included lockdowns and quarantines, **accelerated Internet use (especially fixed)**, at home for teleworking, remote learning, online entertainment, e-commerce, etc.

Ultrafast broadband is no longer confined to purely digital activities, but rather a central part of virtually every aspect of our lives, with the digital side taking over the physical side when the latter becomes impossible, accelerating the transition from physical to digital. One of the major learning of this Covid crisis is that **telecoms have become, and are seen as, an essential commodity.**

a. In 2020, COVID-19 crisis has moderately affected project deployments but significantly boosted demand for high-speed connectivity.

In 2020, deployment targets were mainly reached but with a serious slowdown in Q1.

The crisis has **affected deployments on the short term**, as project deployments have fallen behind schedule in the first months of the crisis (march-june 2020), when most European countries shut down.

The main reasons being, on the one hand, problems of access to the workforce with borders between countries being closed (for foreign workforce hired for the civil works for example) and/or members of the crews on sick leave due to Covid contaminations.

On the other hand, deployments were also halted by problems in accessing the prospects in deployment areas as door-to-door marketing to connect the last mile to home/building was made difficult with quarantine measures, and so diminishing immediate opportunities in those areas where demand exists but infrastructure is lacking**.** Despite this initial slowdown, **2020 deployment targets were more or less reached.**

In 2020-21, COVID-19 has globally accelerated the shift to fibre.

During the first lockdown (from march to june 2020), home-connectivity demand has exploded, mostly due to (forced) teleworking, e-education and video streams. The second lockdown in Q3-Q4 2020 has confirmed this trend and **has then triggered massive migrations on fibre on existing FTTH/B lines** of the B2C segment to cater to needs for speeds and quality of service stemming from augmented Internet uses from home.

From a technical point of view, the existing networks withstood the crisis, with a few marginal adjustments, such as the limiting of data rates for data-intensive video applications. The result has been an increased in FTTH/B subscriptions in areas where the networks were deployed.

For example, the Grand Est project in France recorded an increase up to 40% on take-ups; a level previously seen as taking 10 years. As a consequence, the transport infrastructure (backbones) was upgraded 10 years beforehand.

Here are two examples of accelerations in FTTx subscription growth trends for France and Italy:

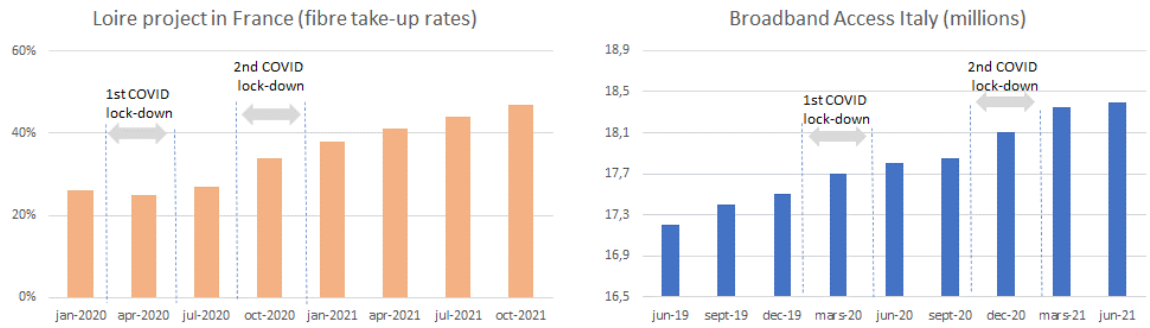


Figure 30. COVID-19 impact on subscriptions
(Sources: France-Vauban IP and Italy-AGCOM)

COVID-19 has put a strong light on the urgency of connecting rural areas.

The experience of annoying lockdown phases in cities (inside small apartments and with restricted moves outside home) has pushed many urban inhabitants to move to the countryside for some time. The population in grey and white areas has therefore increased in the aftermath of the first/second lockdown, increasing an old trend of **migrations to rural areas and adoptions of dual residencies**. This trend accelerated in 2020 and through 2021 paving the way to an urgent need of deployments in rural areas.

Moreover, as ultra-fast broadband became an essential infrastructure for working from everywhere and following the digitalisation of government services, health, education, etc., inhabitants of white areas **are much more willing to pay** to access higher speed broadband.

This connectivity urgency and the increased willingness to pay in remote/rural areas is illustrated by the migration towards higher speeds recorded in satellite, as exposed here with **a significant increase in Ka-Sat internet subscriptions** (net-adds) during the first lockdown in Italy (in yellow).

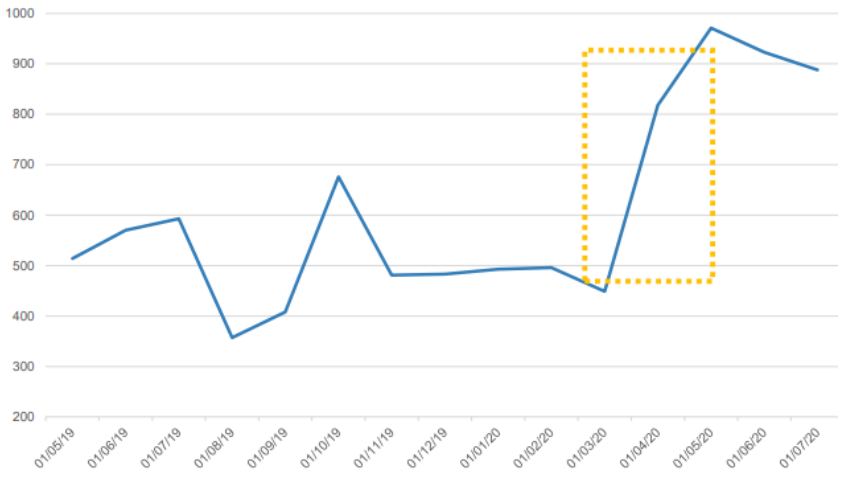


Figure 31. COVID-19 impact on Ka-Sat net-addition subscriptions in Italy
(Source: Eutelsat)

Verbatims

- *"Rollout was delayed by a year as we could not connect private premises and neither go door-to-door to sell the service" "On the other side, we experienced slower speed at peak hours and more calls to call centers"*
- *"COVID-19 has delayed only some deployment projects in 2020-2021, as projects require direct contacts with customers inside buildings/homes, notably during demand aggregation phase and network connection phase and with local administrations, which could not work outside the office. In addition, it was more difficult for construction companies to transfer experienced workers from other EU countries (such as Portugal, Spain, or France)."*
- *"In Sweden, even secondary homes (such as chalets) are often now covered with optic fiber. Fiber is so common that renters usually require fiber from tenants. Operators ask the end-users to pay about half of the investment cost (that could mean €2,000), that is either paid upfront or upon monthly access fees during a certain period. The COVID-19 pandemics has shown that end-users really need capacity from home and that fiber can also re-evaluate the home."*

b. The COVID-19 crisis has generated higher long-term demand expectations, and therefore more investment attractiveness.

Take-up rates outlook has significantly improved, making project more attractive.

The investors interviewed confirmed that the appetite for digital infrastructure has largely increased in 2020 and 2021 during the pandemics phases as take expectations are higher now.

One investor explained that in 2005, the French NRA had forecasts with a long-term penetration of only 50-55%, whereas **(short term) market penetration targets could now be set around 75-80%**.

The improvement in take-up rates outlook (combined with the current financial markets' very favourable conditions) has **a very positive impact on financial plans and on returns on investment**. Furthermore, it reduces the market risk, which has a significant impact on investment decisions.

In total**,** the pandemic has accelerated the demand outlook, as shown here in various EU countries:

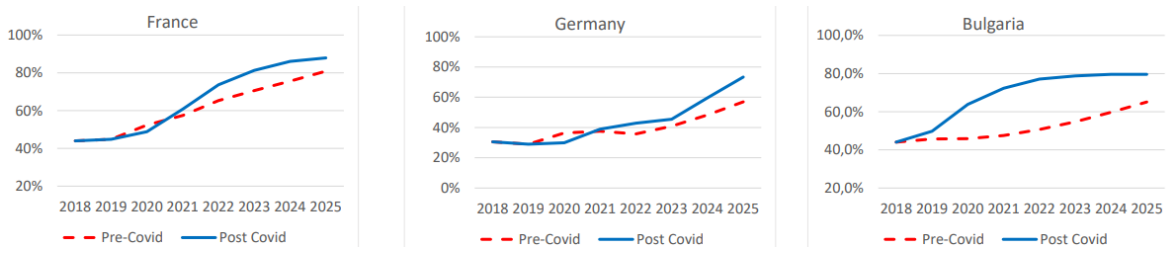


Figure 32. Forecasted FTTH/B take-up rates (pre and post 2020-21 Covid)
(Source: IDATE Digiworld, World FTTx Markets)

Verbatims

- *"The pandemic had also a positive outcome as the subscription take-up rate increased up to 40%, which was not foreseen before 10 years. As a consequence, the transport infrastructure (backbones) was upgraded 10 years beforehand."*
- *"Investors' appetite for digital infrastructure even increased during the pandemics, as take up expectations are higher now."*
- *"Fiber is today very attractive to financial stakeholders, even more after COVID-19. In a few years it went from "nice to have" to "must have."*
- *"In France, the latest concession bids did not even require any subsidy because of the pandemics, take-up rate forecasts are now quite high."*

This acceleration of demand has further increased short term's financial pressure for Telcos.

After the 2020-2021 Covid phase, the need for high-speed connectivity comes now not only from urban or sub-urban areas but also from rural and even deep rural/remote areas, even amplified by NRAs rising the 'Quality of Service' expectations in FTTP standards.

The consequence for telcos is a **massive simultaneous demand of urgent deployments** imposing them to accelerate their plans in the short term, or to leave the field to new entrants or competitors.

It results a very high level of investment need (fibre and 5G) for Telcos, while at the same time, the momentum of National Authorities towards **copper switch-off plans** is accelerating.

In this transition from copper to fibre, Telcos have therefore to bear the cost of an aging copper-based infrastructure, but also the **coming investment for copper decommissioning**. Copper decommissioning in itself requires significant technical and operational resources until the last customer has been migrated, which makes it a costly process for telecom operators.

Besides the operational stress to deliver as soon as possible high-speed connectivity, this situation **dramatically increases the financial pressure** for Telcos as the funding gap should seriously grow in the short-term, up to reaching an unsustainable level of financial effort.

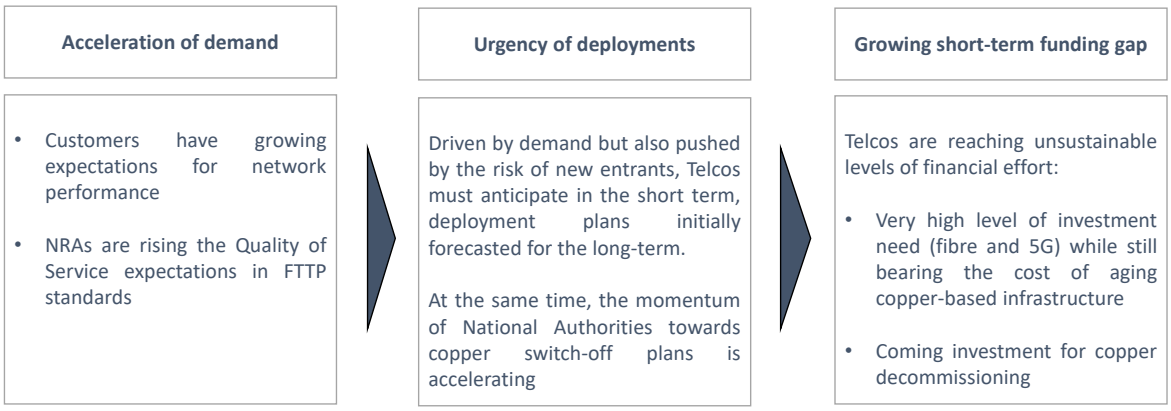


Figure 33. Covid impact as an increased financial pressure for Telcos

6. KEY INVESTMENT CRITERIA REQUIRING PUBLIC POLICY INTERVENTIONS

Even though professional private investors have a deep sense how to assess and to mitigate an investment project, public interventions could be required **to ease the investment process** from project sourcing to financial engagements towards the most underserved geographical areas.

a. Private investors consider projects globally, with all their components

Assessing infrastructure projects is quite challenging as it requires to analyse and to evaluate numerous parameters to get a sense of the **project *risk-return* pattern and of its relevance** to the investor's strategy. There is no *"one size fits all"*, as each project is different in terms of duration, regulation framework, investment size, revenue potential, competition …

"Investment friendliness", "financial return", "execution risks" are key sets of criteria

Investors have a strong interest in digital infrastructure and consider positively broadband projects. Amongst all the usual criteria, they have obviously strong expectations on their own potential **financial return** (the greater the financial upsides for equity investors, the greater the financial risks for debt investors), but they also focus on 2 key sets of criteria: the project **investment friendliness** (regulation, political support, …) and the **execution risks** (roll-out barriers, cash availability, ...).

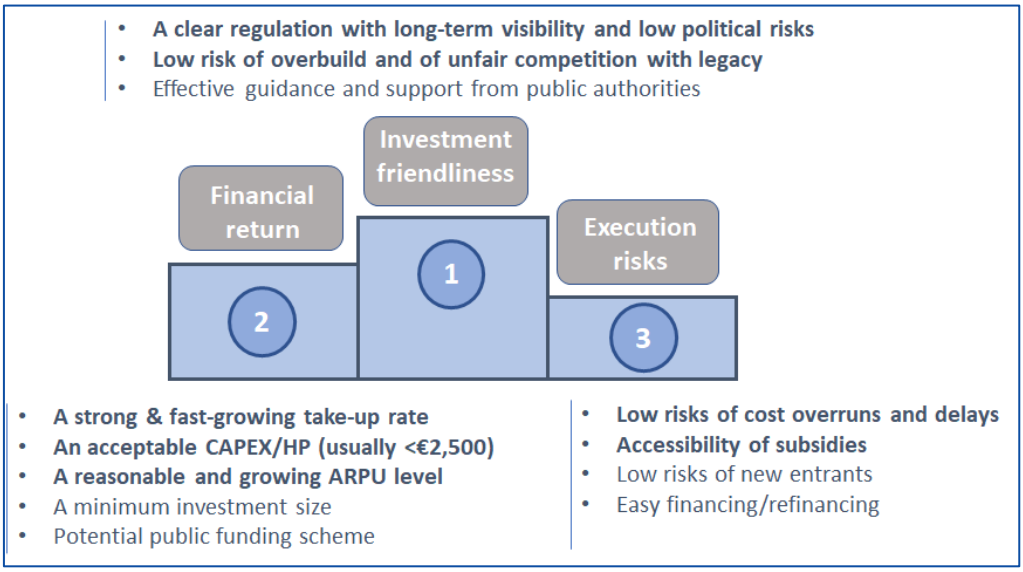


Figure 34. The 3 key sets of investors' criteria

Investment friendliness looks like the number 1 criteria as negative signals would be quickly interpreted as clear NoGos. The potential financial return is typically an incentive to the

investor with regards to other alternatives, and execution risks are areas requiring a strong project monitoring.

Investors usually follow criteria step by step and carefully address dilemmas

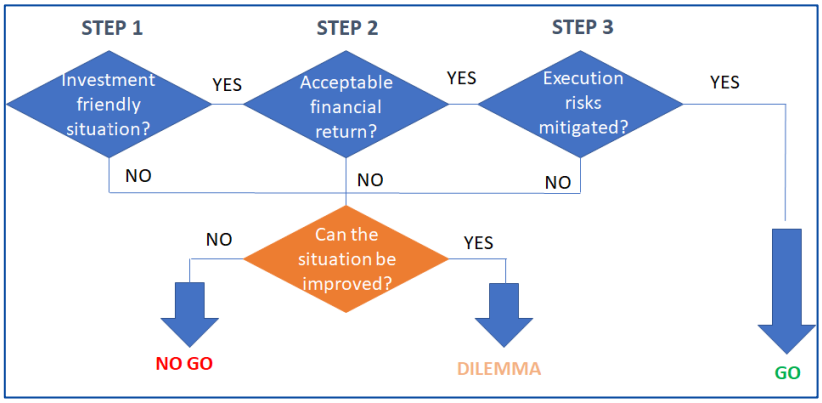


Figure 35. Investors' decision-making process

Investors have usually **a very pragmatic approach** when they assess and decide on investment projects. They go through each step, usually sequentially but sometimes in parallel. For each step, they identify the reasons not to invest and whether these roadblocks could be removed.

These assessments are made with the **support of experts** (market, legal, regulatory, technology, …) and through **a constant dialogue** with sponsors (start-ups, telcos, fibercos, towercos, …), with other financial stakeholders (equity investors, debt investors, banks, …) and often with public authorities (state, regions, municipalities, …)

When the project is completely analysed, if it is attractive enough and backed by strong risk mitigations, the investment decision comes, with various **risk parameters staying under a strong scrutiny** during the project implementation.

b. Investors expect supportive public interventions to back their projects

Each set of criteria is made of several key issues for which investors have developed **project management techniques that can mitigate risk and leverage opportunities**, such as:

- Selecting concession models to guarantee a long-term (15+ years) business visibility
- Developing Infrastructure sharing agreements with other players to reduce risks of overbuild
- Optimal engineering design to reduce costs per HP
- Marketing agreements and IRU with ISPs to guarantee a certain ARPU level
- Demand aggregation, engaging sales process, and anchor tenants' agreements to ensure a minimum take-up rate
- Strong project team selection, tight business processes and contractor negotiations to better control deployment costs and delays
- Support of experts to reach out subsidies

- Land grabbing to prevent new players for entering the project territory
- Support of advisors to get financing/refinancing …

	Key issues	Project management techniques	Potential public interventions	Type			
Investment friendliness	Long-term visibility	Selecting concession models	National programmes + EC backing	P	R		
	Overbuild	Infrastructure sharing agreements	Regulation fostering open networks	P	R		
	Competition from legacy	Strong local promotion	Regulation on broadband advertising		R		
			Copper decommissioning plans	P	R		
	Public guidance & support	Engaging local public authorities	National & regional leadership	P			S
Financial return	Cost per HP	Optimal engineering design	Targeted subsidies			F	
	ARPU/Lease price	Marketing from ISPs	Pro-fiber copper wholesale price		R		
		Indefeasible Right of Use					
	Take-up rate	Demand aggregation	Demand vouchers			F	
		Engaging sales process	Subscriptions from public authorities	P			
		Anchor tenant					
Execution risks	Deployment costs & delays	Project team selection	Broadband Cost Reduction Directive		R		
		Tight business processes					
		Contractor negotiation					
	Accessibility of subsidies	Support of experts	Effective subsidy granting processes			F	S
	New entrants	Land grabbing	Regulatory & administrative restrictions		R		
	Financing/refinancing	Support of advisors	Public funding instruments			F	
			Connection with investors				S

P: Political - R: Regulation – F: Funding – S: Support

Figure 36. Project management techniques and potential public interventions

Each set of criteria require specific public intervention to mitigate risks and to leverage investment. They can be classified under 4 categories: **Political (P), Regulatory (R), Financial (F) and Support (S)**.

In a nutshell, investors expect public interventions to provide:

- An “investment friendly” framework that provides a long-term visibility
- A “pro-fiber” copper wholesale price and well-targeted subsidies to ease business cases
- A strong and effective field support to remove visible or hidden deployment barriers

An “investment friendly” framework that provides a long-term visibility

Main concerns	Expected public interventions
Long-term business visibility and low political/regulatory risks	• (P) Ambitious and well-structured national programmes with a strong long-term political support towards deployment, notably in underserved areas. • (R) Clear EU-driven long-term regulation framework including investment-safe deployment rules (no risk of sudden regulatory changes).
Low risk of overbuild and of unfair competition with legacy	• (P/R) Political and regulatory frameworks fostering open networks • (R) Strong NRA control on broadband advertising (speeds, QoS,…) • (P/R) Clear copper decommissioning plans spread out over 5 years
Effective guidance and support from public authorities	• (P/S) Fostering local projects through strong guidance to municipalities • (S) Connecting project sponsors with local/regional authorities • (P/S) Encouraging mid-size to large projects (>100,000 HPs) to emerge

Figure 37. Public interventions for an improved “investment friendliness”

To ensure **a long-term business visibility**, investors first expect a strong long-term political support at each geographical level (local, regional, national) towards deployment, notably in underserved areas. It requires ambitious and well-structured national programmes but also strong involvement, coordination, and alignment of all public authorities. They also expect a clear regulation framework at EU level that guarantees in the long-term no sudden regulatory changes and somewhat rebalances for the time of the project priorities between investment and competition (cf. Ofcom [36]).

To meet **concerns on competition** (overbuild and legacy), investors expect political and regulatory frameworks fostering open networks to privilege the economical rationality of one common infrastructure for a maximum of ISPs. They also look for protections from possible unfair competition of FTTC/copper legacy networks through a strong NRA control on broadband advertising (misleading marketing on speeds, QoS, …) and clear copper decommissioning plans incentivizing customers and industry players to migrate to fiber in the next 5 years.

Finally, an **effective guidance and support from public authorities** could be (1) helping municipalities to create local projects, (2) helping project sponsors to connect with local/regional authorities or (3) fostering the creation of mid-size to large projects (>100,000 HPs) to emerge by gathering small ones.

Verbatims

- *"We consider that the important factor for increasing private investment would be: (1) Stable regulation and better visibility on potential scenarios: how infrastructure would be regulated going forward, what happens when there is consolidation between a regulated player and an unregulated player… (2) Effective and efficient state support: subsidy regime targeting only very costly areas and preventing unfair tactics which could lead to distortion of competition… (3) Regulation preventing the risk of overbuild: the French model could inspire other countries."*
- *"To increase private investment in underserved areas, public policy makers should consider that greenfield comes with risks, so investors want to be rewarded for that risk. So, the more certainty they give that no other networks will be there and that there will not be any regulation surprises, the more attractive it is. France has been governing its broadband deployment plan in that respect."*
- *"More than money (although necessary when there is an investment gap), the EU should concentrate on developing the relevant regulation framework that provides long-term security to investors in equity and debt. In this market, economic rationality is important to avoid overbuild but clear consistent rules matter as well, to bring enough confidence regarding risk levels."*
- *"Regarding FTTH, the main risk parameter in investment decision-making is the investment long-term visibility. It mainly relies on competition." "In FTTH development, there will be a tension in some geographical areas between public authorities' objectives to get competitive prices as soon as possible and investors' need to have a business environment with predictable long-term revenues."*

[36] https://www.reuters.com/article/us-britain-broadband-idUSKBN2BA0M5

- *"Investors could be more attracted in Europe if regulators and national institutions could better market and communicate on the benefits of fibre to better educate end-users. These measures could drive take-up ratios in countries where fibre competes with mobile networks."*

A "pro-fiber" copper wholesale price and well-targeted subsidies to ease business cases

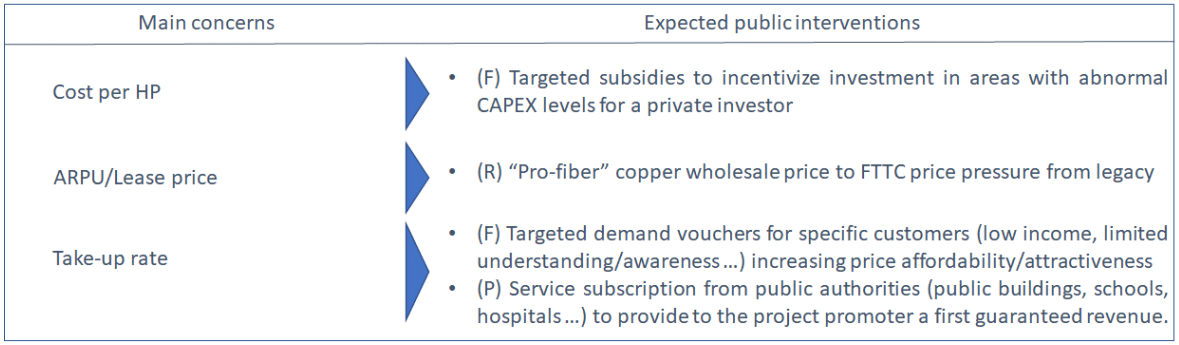


Figure 38. Public interventions for an acceptable financial return

Investors have defined expectations on projects' financial return under various scenarios. These expectations can be difficult to meet, typically in rural areas where CAPEX is higher and demand lower due to a lack of understanding/awareness, low income, and a reduced number of enterprises.

To make business cases attractive enough, public interventions can play on 3 variables:

- **Reduce extreme CAPEX levels** through targeted subsidies on relevant areas
- **Limit potential competition from legacy** networks through a high copper wholesale price
- **Increase take-up rate** through targeted demand vouchers towards specific customers, and possibly through service subscriptions from public authorities for their own administration, as a first guaranteed revenue to the project promoter.

Verbatims

- *"When analyzing projects, we focus first on the market environment and the regulation, the ISP structure, the expected demand from end customers based on socio-economic factors and the demography. Then we look at the competition in the area and the backbone connectivity. Finally, we balance the market opportunity with the CAPEX per home passed (and per home connected) to make the final decision."*
- *"Because they can make projects economically interesting, subsidies are usually necessary to ease financial stakeholders' engagement. To be efficient, this should*

be done through biddings, leveraging on private stakeholders' assessment of the public support need."

- *"We consider that a regulatory framework that reduces the risk of overbuild is more important than subsidies. Subsidies help the financing case, but they can have strong drawbacks. First, experience shows that it is sometimes complicated, long, and burdensome to get them paid to the fiberco project companies, so banks are now "discounting" subsidies, running sensitivities to test smaller amounts of subsidies eventually getting paid, or delays in their collection. Second, subsidies are often tied to strong deployment obligations with potential penalties if not reached. In the case of a project supported by subsidies, We make sure that the project is well financed from the start, so that it can be rolled out in time limiting therefore the risk of penalties getting triggered."*
- *"The potential price discrepancy between FTTC and FTTH can be a migration barrier towards fibre. This issue is carefully considered by investors."*
- *"Fibre projects are appreciated because high roll-out costs prevent new competitors from entering in an area and the infrastructure will also be there for a long time, but the hurdle is the penetration rate."*
- *"Regarding competition, the stability and predictability of wholesale price regulation is key. When the wholesale prices are high enough, it gives more space to new entrants."*
- *"Subsidies are really interesting when no company can develop the same project without them, as it prevents the project sponsor from new entrants. Another interesting protection for the investor is when public authorities can bring some early revenues as clients (schools, hospitals, public buildings…)."*
- *"Up to date only 40% of end-users vouchers have been requested and 70% of them went to FTTC connectivity. The second phase should address the risk that vouchers are not used for FTTH, despite the requirement from the Gigabit Society of a minimum 100Mbps."*

A strong and effective field support to remove visible or hidden deployment barriers

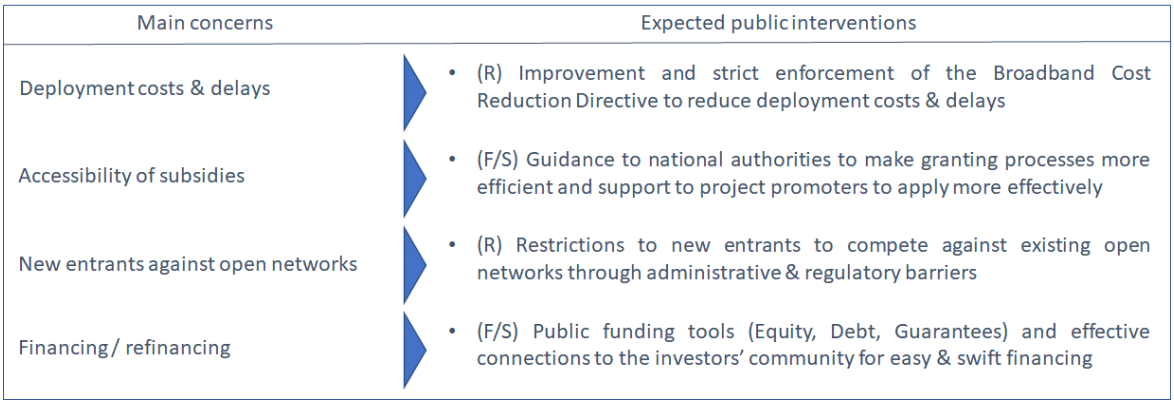


Figure 39. Public interventions for cleared execution risks

To reduce project execution risks, public interventions could have the following benefits:

- **Reduce deployment costs and delays** by improving and strictly enforcing the Broadband Cost Reduction Directive at the lowest local administrative level
- **Improve the accessibility of subsidies** by helping national authorities to make granting processes more efficient and project promoters to apply more effectively
- **Reduce the risk of new entrants** to compete against (and potentially destabilize positive economics of existing open networks) through effective administrative & regulatory barriers (e.g., long-term concessions, restrictive use of subsidies, political support to a single player...)
- **Ensure an easy & swift financing** through public funding tools (when relevant) and effective connections to the investors' community

Recommendations on public financial interventions are **further developed in section 7**.

Verbatims

- *"In one country of operations, from the project inception (when fully financed) it takes 11 months to get the first Home Passed and another 2 months to convert it and to get the first revenue. In another country, it takes similarly 20 months to get the first Home Passed and another 2 months to convert (in case no existing infrastructure is present). During that time, bank interests are running, so time (and delays) is money. The administrative barriers must therefore be removed and the "Cost Reduction Directive" should become a regulation, not a directive."*
- *"Red tape influences a lot the investment decision. Even when there is a strong official support at regional or local level, it can be difficult to get permits and authorities are sometimes reluctant to close roads as it is disruptive and expensive."*
- *"There is a need to orchestrate fiber deployments at country/ European level to better define the right use of subsidies, to prevent unfair competition and to avoid unnecessary costs."*
- *"We do not particularly look for subsidies in projects and has supported many projects that did not receive any government financial support. However, it really wants to make sure that the regional/national government is fully supportive of the broadband policy, so there could not be any political obstacle to deploy it."*
- *"We strongly believe that regulation should privilege open access networks and try to limit fiber infrastructure competition for open networks. As there is just one network for water, gas or electricity, there should be just one fiber per home."*
- *"We always had a strong conviction on telecom networks under concessions. The concession by the local public authority over 15+ years provides a "contractual monopoly" as it supports one single network covering defined rural areas. It creates therefore a barrier of entry to the network under concession but also provides a long-term visibility to the investor."*
- *"To increase the volume of investment-ready projects, organizing a subsidized scheme to promoters for cash-poor projects could be a good idea (in order to*

allow them to develop their projects to a level where a fund could pick them up), potentially combined with a support from NPBs on the sourcing."

c. Investors are eager to detect projects and to address new geographies

In the current land rush, investors have been concentrating on **the most visible and the most accessible projects**, mainly in the Western part of the EU and in geographical areas where public authorities had already designed or paved the way to private FTTH projects.

Although, a large part of the potential FTTH deployments is not easily visible as **it requires to have connections** with local public authorities or with sponsors that have identified opportunities. In addition, each country has its **own telecom regulation and investment ecosystem**, which needs to be studied in detail, and could sometimes deter investors from considering projects.

Investors expect local public authorities to form projects and sponsors to develop them

The combination of public authorities, project sponsors and investors represent broadband deployment ecosystems where every stakeholder has its role. Local public authorities organize and/or facilitate the deployment, sponsors run projects and investors finance them.

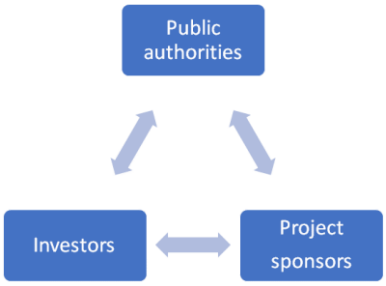


Figure 40. The broadband deployment ecosystem

Municipalities and local communities are often lost when it comes to organizing FTTH deployments when they do not have skills, budget and connections with potential sponsors and investors.

A public policy intervention at EU level could be to provide some **guidance to local authorities** on:

- How to design FTTH projects (size, organization, frameworks, …),
- How to attract sponsors (connections, calls for tender, selection, …),
- How to attract investors (identification, financial structuring, deals, …),
- How to foster the project implementation (political, financial, and administrative supports),

- …

Similarly, sponsors (entrepreneurs and other project promoters) need to be **supported in identifying opportunities and in developing them**. A public policy intervention at EU level could be:

- To map each member state showing existing FTTH networks, future projects, and left-out zones,
- To provide contacts to local public authorities and data to understand the local regulation,
- To provide guidance to better organize the project and tips to avoid traps,
- To provide connections with public funding stakeholders and with private investors,
- …

Finally, both local communities and sponsors need to be supported in **making the project attractive to investors**. A public policy intervention at EU level could be to ensure that projects are following **key best practices** from successful project funding cases, such as:

- Preferably mid-size or even large projects for a large exposure and for better risk mitigation,
- Mobilization from local authorities for a successful project implementation,
- Protective framework against new entrants (e.g., concession, restrictive subsidies, ...),
- Supportive public funding schemes (e.g., subsidies for high CAPEX, guaranteed revenue, …),
- Large agreements and/or partnership with ISPs…

Recommendations are **further developed in section 7 and 8**.

Verbatims

- *"Developing FTTH projects in rural areas will require associating local municipalities with investors. National bodies and regulators should therefore develop a financial and legal framework/methodology supporting municipalities on: (1) how to develop the project (technical documentation), (2) how to structure investments (legally and financially) and (3) how to collaborate effectively with private stakeholders. On this basis, the European Commission could support local municipalities through technical assistance and potentially provide an additional financial support."*
- *"In Europe, most significant underserved areas have been connected, and the remaining white areas are often scattered. When entrepreneurs can "package" these spots into a single larger project, public support is not necessarily required*

for the remaining areas. Small private UK entrepreneurs managed to do it, thereby accelerating fibre deployment in the country. Therefore, public policies should promote and assist entrepreneurs to develop local projects by identifying and defining areas where incumbent will not operate."

Unmet investment needs must be more visible, notably in areas out of investors' radars

According to investors, the financial community is very well connected, from equity investors to commercial banks and debt funds. The usual project sources are **sponsors and/or banks** (as the first financial stakeholder to be involved in a project) and are often largely shared amongst investors.

Financial intermediaries/consultants are quite active to advise project sponsor and make connections with investment funds and banks. Some equity/debt investors come even before, acting as **project developers** and designing projects from scratch with municipalities. Municipalities also sometimes contact National Promotional Banks to identify with them the first public funding opportunities.

Although, the sharing of opportunities amongst the community is **uneven** as investors are usually focusing on some specific countries and privilege also their own business network of financial players.

Many potential projects **look also invisible** as investors cannot screen all areas and contact every municipality. Finally, investors tend to **discard CEE member states**, because lacking background in telecom and investment regulations and a good business network inside the country.

Investors globally expect a public policy intervention at EU level for an improved broadband project visibility, which could be at various stages:

- Inception (Municipalities)
- Small projects (Sponsors and Banks)
- Mid-size and large projects (Sponsors and Investors)

Investors would also expect more support from the European Institutions (e.g., EIB) in the CEE to better assess the opportunities and potentially co-invest to reduce the risks

Verbatims

- *"Regarding the situation in the EU, the CEE countries is less considered by investors as some funds are limited to the Euro-zone and/or in some cases the country risk is seen as significant."*
- *"Even though there can be interesting investment cases, investors tend to avoid some jurisdictions, typically in the CEE potentially subject to political instability, where legal frameworks (property law, security claim/enforcement …) and legal processes can sometimes look as unclear or unknown. A support from European Institutions would be much welcome."*
- *"For now, we rely on relationship with financial investors and telecom operators to get available projects. Many projects do not emerge or are not visible enough (e.g., Eastern Europe) and there is no database with an easy access that would highlight areas that require investment the most. With this information, we could bring ideas to sponsors as it is usually the other way around (sponsors bid for*

tenders in regions and come to us to get some debt financing). We believe there should be at an international level more available information on areas that need investment. It is currently very challenging to get this data, especially all across the EU."

7. RECOMMENDATIONS ON PUBLIC FINANCIAL INTERVENTIONS

Investment projects are **financial resources creating industrial assets** that ultimately **generate value** for the funding stakeholders.

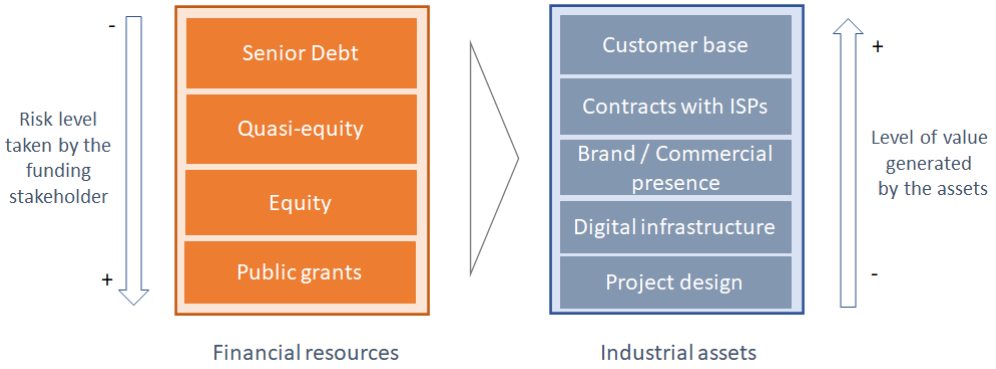


Figure 41. Value creation in investment projects

Financial resources can be **ranked upon their risk level with respective return expectations**:

- Public grants: full risk but high benefits for society and substantial economic externalities
- Equity: high risk/high return on investment
- Quasi-equity: moderate risk/moderate return on investment
- Senior Debt: low risk/low return on investment

Applied to digital infrastructure, industrial assets can be **ranked upon a growing level value**, such as:

- Project design: gives an estimate of the potential project value
- Digital infrastructure: is a real asset, ready to be commercialized
- Brand / Commercial presence: provides marketing/sales capabilities
- Contracts with ISPs: materializes sales potential through distribution channels
- Customer base: transforms the project into potential revenues

A project approach starts usually by:

- **By gathering the financial resources accepting the higher risk** (equity and grants) before engaging credit stakeholders (quasi-equity and senior debt),
- **By building up the value creation from low value assets (project design) to high value assets**, either by developing them, by acquiring them or by partnering with complementary players.

a. The very favorable current financial market conditions should push towards more projects privately financed without any public funding support.

The investment value is related not only to forecasted revenues but also to cost of capital.

The project value (NPV) is assessed through the cumulated discounted cashflows upon a timeframe.

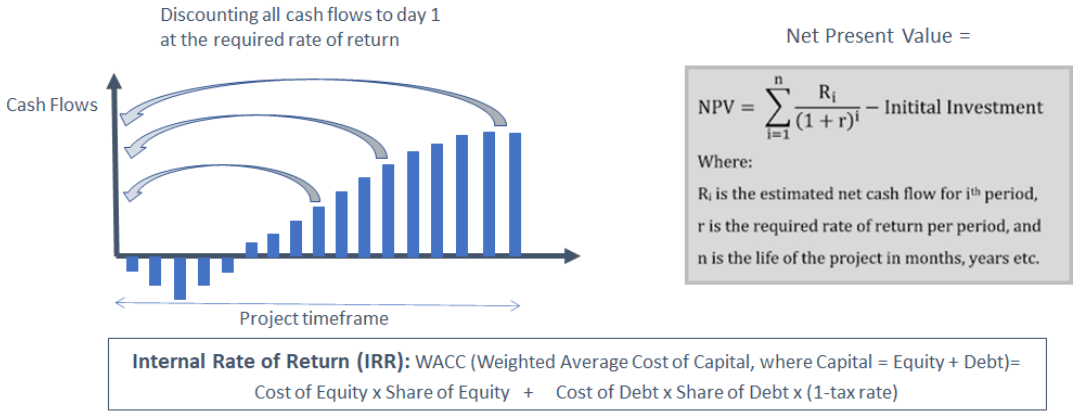


Figure 42. Project value assessment through discounted cashflows

Cashflows are discounted upon an **"Internal Rate of Return"** that represents the cost of capital of the main funding resources (Equity and Debt). Grants payments are integrated in the cashflows.

In fibre projects, funding is usually split between **around 30-35% in Equity and 65-70% for Debt**. Investors tend to consider **at least 20 years (up to 30 years)** as a project timeframe and can include a **terminal value** for the last year, which represents the value created by the project continuation after the given project timeframe (20 to 30 years).

To evaluate this terminal value, for example investors can consider "maintenance CAPEX" to replace the network every 40 years (and electronics every 7-8 years) or investors can generate an "artificial repayment profile" leading to a full amortization of the project CAPEX.

However, the terminal value is highly discounted (over more than 20 years) and according to investors, has therefore **a marginal impact on the project value**.

The investment value is highly sensitive to the Cost of Capital.

We have taken the hypothetic case of a rural wholesale network facing no competition (100% take-up after 20 years), representing an investment of **€150 million for 100,000**

homes and a wholesale ARPU (lease revenue per line) of €15/month, subject to a 2% p.a. inflation rate and with **no price cuts** (e.g., due to regulation). WACC is calculated at around 5% p.a. (10% for equity and 3% for debt).

The project value is assessed over a timeframe of **25 years** and does not consider here any terminal value.

• Project base case:		• WACC (Equity 30% - Debt 70%)	
➢ Investment:	150 M€	➢ Cost of Equity:	10% p.a.
➢ Number of Home Passed:	100,000	➢ Cost of Debt:	3% p.a.
➢ Lease revenue / line:	15€/month	➢ WACC:	5% p.a.
➢ EBITDA margin:	80% (after 5yrs)	• Price inflation	2% p.a.

Figure 43. Project case of rural wholesale network

In our case, if the WACC increases by 2 points, the investment value is almost **divided by 2 (-85%)**.

The current financial and market conditions dramatically reduce projects' 'funding gap'.

The global saving glut combined with the Central Banks expansionary policies (e.g., FED and ECB) driven by low interest rates **have dramatically reduced the long term cost of capital of projects**. The stiff competition between financial investors has also contributed to push down required returns on investment and lending conditions.

In parallel, COVID-19 crisis has boosted **take-up rates in the short and long term**, so that the business visibility and the perspective of cash flows is significantly enhanced for investors.

The following graph shows the sharp decrease in the share of public funding in concessions projects in France. When projects 5 years ago where largely financed through public funding (more than 40% of the project budget), since 2019 grants **are generally no more required by investors for projects**.

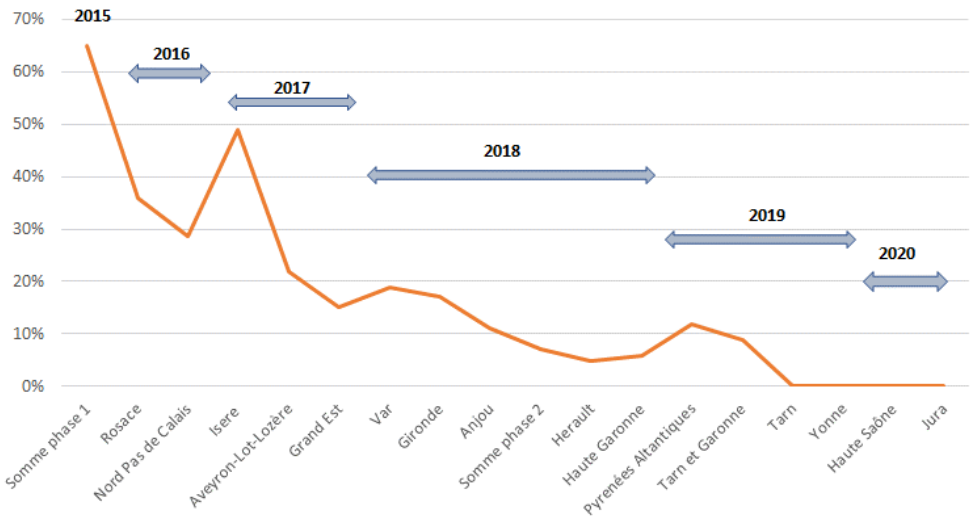


Figure 44. Share of public funding in major French concessions

All these very favorable conditions advocate for **an increased exposure of broadband projects to private investment**, leading in most cases to the absence of public funding.

b. To address areas with high CAPEX per HP, public authorities should help project promoters and investors to improve their expected revenue profile.

CAPEX thresholds per HP could be reversely estimated through revenue expectations.

We developed an "HP-based" financial model, that considers for each investment made (CAPEX) on a given line (home/premise), a period without revenues and another period generating revenues.

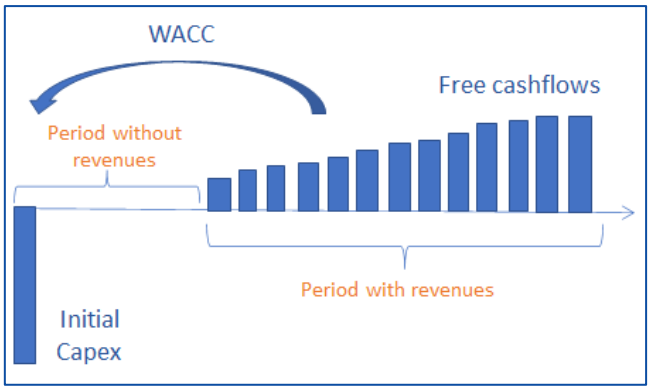


Figure 45. HP-based financial model

Given an indicative wholesale ARPU (collected through interviews), we have **calculated reversely indicative CAPEX levels** that would match the cumulated forecasted Discounted Cashflows (DCFs).

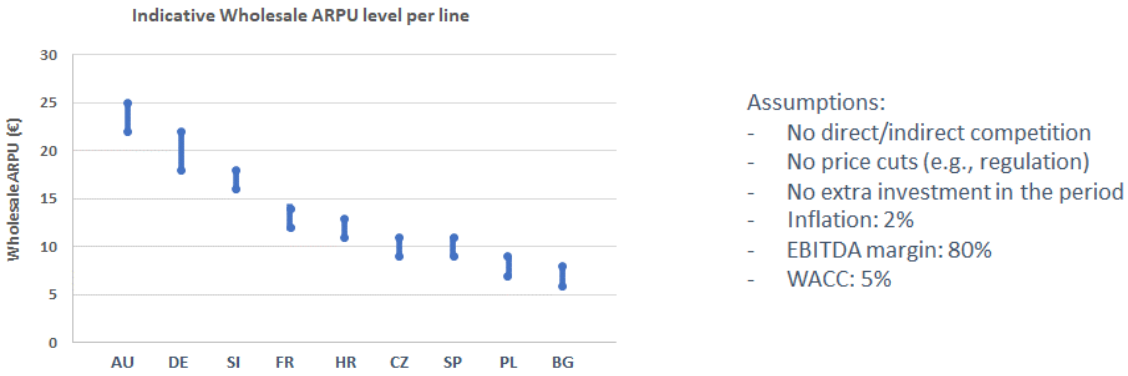


Figure 46. Wholesale ARPU level and major assumptions for indicative CAPEX calculation

We have taken the hypothetic case of a wholesale network **without direct/indirect competition**, not subject to price cuts (e.g., through regulation), without any extra investment in the period. Inflation is supposed to be at 2% p.a., EBITDA margin at 80% and **WACC at 5% p.a**.

We have run computations in diverse scenarios:

- One **with revenues starting 5 years after** (and sub-scenarios of 15 or 25 years of revenues)
- The other one **with revenues starting 10 years after** (with the same sub-scenarios)

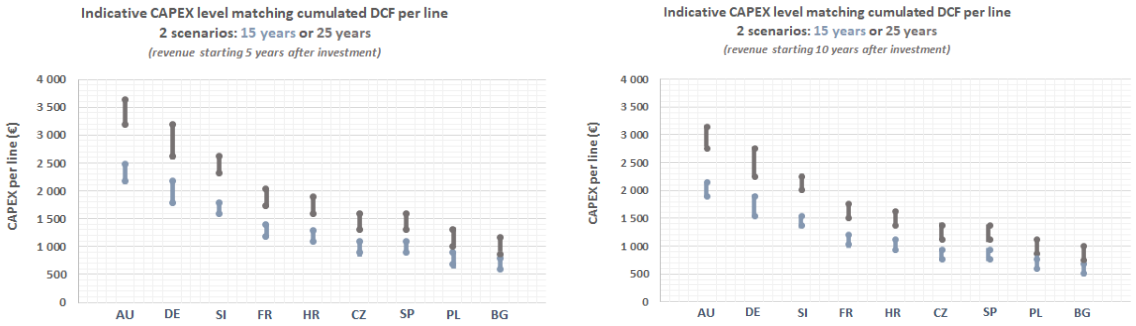


Figure 47. Indicative CAPEX level in various scenarios

This purely theoretical study shows the impact of the period without revenues in the potential CAPEX level per HP. In our example with our assumptions, **a delay of 5 more years for the first revenues decreases the potential CAPEX level by -15%.**

Even through, this calculation has been made on a connection basis, it could be extrapolated to a whole set of connections when considered as **an "average situation"** for the whole network.

In parallel, it goes without saying that the perspective of revenues dramatically enhances the acceptance for higher CAPEX per HP. In our example with the given assumptions, an exploitation of 25 years instead of 15 years (+10 years) **increases the potential CAPEX level by +46%**.

To encourage investment in the riskiest areas, public authorities should help promoters to reduce the time to get the first revenues and to ensure a long exploitation potential.

To reduce the period to get the first revenues, public authorities could:

- Reduce **deployment delays** linked to administrative rules, building permits, roadwork authorizations, access facilitation to public infrastructure (roads, ducts, public buildings, …) …
- Facilitate **end-user engagement** through demand aggregation, connectivity vouchers, pro-fiber ADSL price regulation, strong political support …

To ensure a long exploitation potential, public authorities could:

- In the case of concessions or more generally PPPs, make sure **the duration is long enough** (25-30 years looks today as a reference, but could be extended).
- In the case of private projects, ensure that it benefits from a wholesale approach and that **neither competition, nor regulation** could affect its exploitation potential in the short term.

c. As much as possible, grants should be seen as an opportunity to trigger private investment, and also as the loop-back variable in project funding.

According to interviews, grants are seen by investors and project promoters as imperatively required in some **specific cases where the investment is fundamentally unattractive**.

They also underline that the granting process is often **complex, inefficient with too much red tape**. The grant payment can **take long** and it requires them to have some administrative knowledge and to follow strict monitoring rules. As a result, some promoters are **tempted to skip grants** (or sometimes lose them!), while large players (e.g., telcos) manage them better thanks to their administrative staff.

Public funding is an opportunity to trigger private investment

Two cases in Austria and in France show the benefits of leveraging public grants to attract investors:

nöGIG case (Austria): a Public Private Partnership project

The state of Lower Austria (1.7 million inhabitants) has set up the company nöGIG as **100% state-owned** (€35m equity) to initially roll-out an open public FTTH network in rural areas for 35,000 HPs.

nöGIG operates under a 3-Layer Open Model (3LOM) in wholesale with a strict separation of passive infrastructure (public), active network (private operator) and service provisioning (private ISPs).

After 4 years, **Allianz ACP invested is the company and owns now 74.9% of the shares** (25.1% for the State of Lower Austria) in order for nöGIG to invest €300m in a deployment extension to 100,000HPs.

The second phase is not supported by grants from the State of Lower Austria, only by the ones from the Austrian central government that managed to reduce significantly the deployment cost.

By providing the required funding for a small scale and by dedicating an operational team to roll it out, the State of Lower Austria **has managed to attract a large investor** that will finance a second phase of network roll-out in more costly areas (>€3,000 per HP) bringing it to a total of 135,000 HPs.

After 30 years, through this PPP, the entire infrastructure (135,000 HPs) will be property of the region.

Case study of nöGIG

nöGIG is originally a company created and 100% owned by the State of Lower Austria to roll-out an open public FTTH network for households, enterprises, and public facilities in rural areas.

nöGIG has originally set up in 2015 as a first phase a project with 4 pilots in different white areas in Lower Austria, targeting 35,000 HPs, financed through €35m equity from the State of Lower Austria. nöGIG has additionally competed for and won national grants. To comply with State Aid rules, nöGIG has run an EU notification process for the equity from the State government and was using the national EU notification for the grants from the central government.

Before this first phase, there was already an interest from investors, but they were looking for a first proof-of-business before investing. This is the reason why the State of Lower Austria has decided to start itself the project by creating an infrastructure entity financed initially 100% with public money.

In 2019, following the completion of the 4 pilots, a second phase has started targeting 100,000 additional HPs (but not only in white areas). In this phase, the passive infrastructure (including the part built in the first phase) is realized by a private company owned at 25.1% by the State of Lower Austria and at 74.9% by Allianz Capital Partners (ACP).

The two partners have set up a Public Private Partnership (PPP) agreement that after 30 years the entire infrastructure will be property of the State of Lower Austria. The budget for the second phase is €300m. Before selecting Allianz CP, the project had attracted more than 30 equity companies.

135,000 HPs represents 1/7 of the total number of premises to be connected in Lower Austria. nöGIG targets rural areas made of communities lower than 5,000 inhabitants and strategic points (ex: roads). The PPP approach developed by Lower Austria with nöGIG has been a blueprint for other Austrian Regions such as Upper Austria, Styria, Carinthia that already benefit from investors' market awareness.

According to Mr Brusic, Vice-president nöGIG Service GmbH, 3 points are critical to attract investors:

- Fiber deployment is an infrastructure project, not an investment in a Telco. It must hence be realized the same way as a harbor, a road, or an electrification project and financed through financial institutions specialized in infrastructure projects, such as Allianz Capital Partners which finance over the long term and are used to work with public authorities. Their first focus is the kind of public support in the project. For infrastructure projects as public roads, private investors appreciate concessions, whereby the public authority is covering the funding gap. Although, the second phase of nöGIG with ACP is not realized as a concession but as a PPP project that split up the risks of the public side and the risks of the private side.
- The organization of the project and the level of expertise/know-how of the project team to build/deploy the network in a fast pace to ensure rapid implementation to the investor. The pilot project has enabled nöGIG to show its roll-out expertise to Allianz CP: the professionalism of the team, the chosen support systems, the established operational processes…

- The size of the project (>€250m) that can ensure a large money exposure to the investor and that the deployment costs will not increase dramatically during the construction. Equity investors are looking for exposing above €100m.

Grand Est case (France): a Concession project

Grand Est is a French region of around 5.5 million inhabitants. It has developed successively two projects (2016 and 2017) under concession models over respectively 30 years and 35 years:

- ROSACE (for the 2 *départements* of Alsace) targeting 400,000 HPs over 700 municipalities
- LOSANGE (for 7 other *départements*) targeting 1 million HPs over 3,400 municipalities

In a concession model, the public authority gets back the ownership at the end of the concession.

In both cases, public funding (grants) was available, but the financial attractiveness enabled to dramatically reduce the need from 80% to 36% for ROSACE and from 60% to 15% for LOSANGE. A claw-back mechanism has been set up in the 2 projects and will be activated in 2022 for ROSACE.

By developing a 'de facto' rural/suburban monopoly with a (very) large size and a long project duration (more than 30 years), the Grand Est region has not only managed to attract private investors at a large scale, but dramatically reduced its required public support.

Case study of Grand Est

The French Grand Est region has two separate projects for unserved areas that have merged in 2019: The ROSACE project covers the Alsace part and the LOSANGE project covers 7 other *départements*.

In each of them, the region launched a call for a project to build, run and operate a broadband network as a wholesaler for ISPs. The project is run under a timely limited privately-run network investment model ("concession" in French) of 30 years for ROSACE and 35 years for LOSANGE. At the end of the period, the public authority (region) becomes the full owner.

In each of them, a construction company NGE Concession won the call to manage the project together with other co-investors:

- In ROSACE, shareholders are NGE Concession (8%), Altitude Infrastructure (8%), Marguerite fund (37%), Quaero fund (27%) and Caisse des Dépôts (20%).
- In LOSANGE, shareholders are NGE Concession (10%), Altitude Infrastructure (10%), Marguerite fund (22%), Quaero fund (25%) and Caisse des Dépôts (33%).

The two projects ROSACE and LOSANGE raised a large amount of private capital: 64% for ROSACE and 85% for LOSANGE. They were the very first "Concession model" projects in France.

According to Franck Siegrist, Director of Digital Development for Grand Est region, A publicly supported wholesale network under a concession model can bring some certainties to investors. It reduces the competition risk as it is the sole network financially supported through public funding in the targeted areas (usually rural or semi-urban zones) and it also brings a long-term visibility (several decades of exploitation) to reduce the uptake risk.

According to Mr Siegrist, one of the reasons for the attractiveness to investors was the project size (ROSACE covers 400,000 connections over 700 municipalities and LOSANGE covers more than 1 million connections over 3,400 municipalities), as well as the mix of zones with almost no existing broadband connectivity and zones with limited existing broadband connectivity. The project size increases the IRR potential and mitigates the investment risk.

Mr Siegrist believes that the main drivers for investors under a French PPP model ("concession") are the *'de facto'* monopoly, the project size, and the project duration. Investors like to see large projects (over 300,000 HPs) and long durations (typically, 15 years is too short for investors while 30-35 years looked attractive in the two projects).

Thanks to its project attractiveness ROSACE managed to reduce the need for public funding from 80% to 36%. Similarly, the LOSANGE project managed to reduce it from 60% to 15% and a part of ESIF funding was not even activated. In both projects, a claw-back mechanism has been set up to the share with the Region the project extra-value.

How to attract investors through public funding

These two cases show that an available public funding amount could be used by Public Authorities:

- Either **to prove to investors the financial attractiveness** of the project (nöGIG)
- Or **as a kind of 'guarantee'** to cover the potential funding gap (Grand Est)

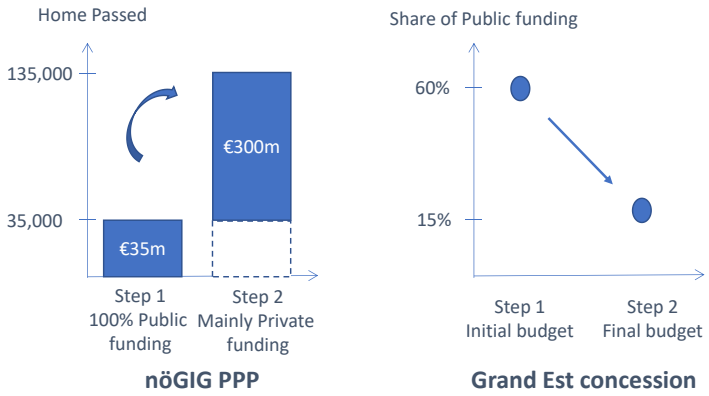


Figure 48. Public funding leverage for private investment

Through negotiations, this public support can have **a substantial leverage effect** on the private funding, and in these cases even includes a final ownership of the digital infrastructure by the public authority.

There is always **an 'optimal point'** that maximizes the benefits of the blending for both parties.

In these two cases, investors have been attracted by **the size of the investment (over €300m), the 'de facto' monopoly** of a wholesale rural project supported by the regional authority and **the long duration of the project** (over 30 years).

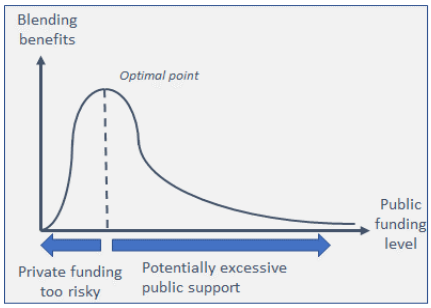


Figure 49. Blending optimal point

Grant support should be the ultimate tool (*loop-back variable*) under a cascade approach

Considering the very favourable current financial market conditions, we believe that more projects have the potential to be privately financed without any public funding support (see 7.1).

When analysing a project, a typical approach should be first to attract private investors, then back the potential public support through risk instruments and credit enhancements, before finally looking for public financing.

As a result, grants should come at the end as a loop-back variable in the event that the project is not attractive enough to be funded by the previous sources.

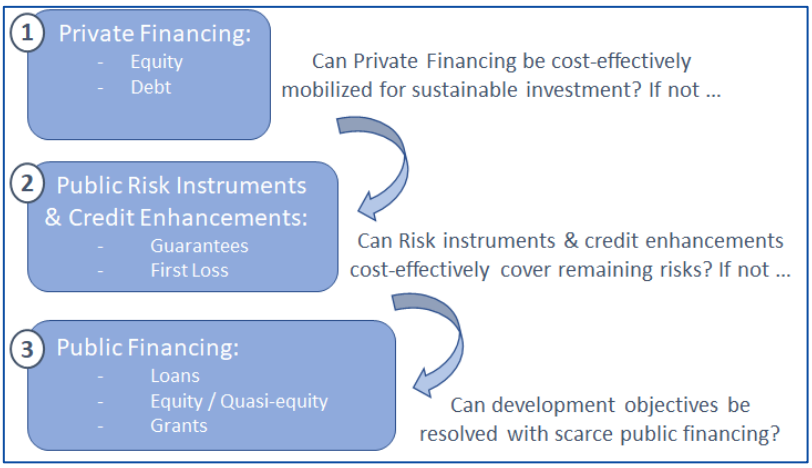


Figure 50. Cascade approach for project funding

It is worth noting that grants have also **practical drawbacks** for both parties:

- For project promoters: **administrative burden, possible undervalued grant, claw-back**
- For public authorities: **processes, risk of excessive funding regarding the long-term potential**

To avoid them, EU grants could opportunely be transformed into financial instruments such as:

- **An Interest rate subsidy or a guarantee subsidy** that will soften or de-risk a loan
- **A performance-based grant**, which could include a forgivable loan, a recoverable grant or a convertible grant

A performance-based grant is either fully reimbursed (recoverable grant), lost (forgivable loan) or turn into equity (convertible grant). It both **eliminates the claw-back constraint**, **the administrative burden,** and **the risk of undervalued grant** for the project promoter and ensures that there will not be any excessive public funding.

Last but not least, all these financial instruments enable **an upfront payment** to the project (instead of upon achievements), which is appreciable for project promoters regarding the cash monitoring.

These instruments have been developed by the fi Compass team[37] from the European Investment Bank and are put in place according to their needs by implementing partners such as the NPBIs.

Example of a loan instrument and a guarantee instrument leveraging ESIF funding

Regarding very interesting financial instrument case[38] has been developed by the NPB Bank Gospodarstwa Krajowego (BGK) in the framework of the Digital Poland programme.

A €145m financial instrument is managed by BGK acting as a Fund of Fund (FoF) manager and implemented through financial intermediaries.

This financial instrument is providing **an efficient funding support** for deploying the last mile, even in grey areas.

Study case of BGK

An ex-ante assessment, finalized in 2017, the investment in the 'last mile', meaning the connection from the glass trunk line to the client was identified as a major market barrier. It is common in Poland that this last mile connection is provided by a small and medium-sized ISP, which:

- have a problem accessing to European Structural Investment Funds (ESIF)
- cannot find any bank loans as commercial banks consider the risk due to competition between different ICT technologies (fibre vs. mobile data), strong competition between small operators and the demand risk
- cannot find banks willing to accept the invested infrastructure as a collateral, as there is no functioning market to sell glass fibre networks.

It is difficult for the public authorities to address these barriers with financial support due to the specific State Aid regime for ICT as public support is limited to 'white areas', leaving out 'grey and black areas'.

[37] FI Compass Knowledge Hub + Combination of financial instruments and grants
[38] The Polish broadband loan instrument

A loan instrument with an allocation of €250m was proposed. Whereas grants are limited to 'white areas', the loan instrument can support investments in 'grey and black areas'.

In 2017, €230m from ERDF funding was committed originating from the Operational Programme (OP) of the managing authority to the FoF for the broadband loan instrument. Additionally, financial intermediaries have to contribute at least 15% private national co-financing to the financing instrument, resulting in OP resources of €270m being available for this instrument. Two financial intermediaries have been selected and had to prove that they have the technical capacity to appraise projects in the ICT sector.

The loan can cover up to 95% of the eligible cost of the projects with the remaining amount to be provided by the network operator. The minimum size is €5,000 and the maximum is €12.5m with an expected average size of €170,000. The maturity of the loan is 15 years with a grace period of up to 2.5 years.

The ESIF part of the loan will be priced at 0.25% per annum and no fees will be charged when risk related interest and fees will be charged on the part provided by the financial intermediary. The loans are provided under de 'de minimis' rules and thus can be used in white but also in 'grey and black areas'.

In 2018, several changes were introduced in response to several implementation barriers:

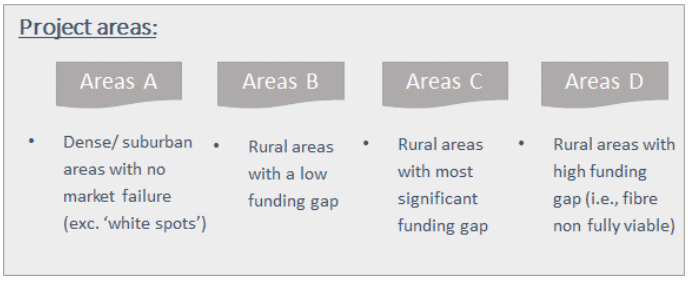
- The scope of eligible expenditure was widened to VAT and working capital and projects already in construction but not physically completed can now also receive financing.
- It is now possible for the financial instrument to finance projects receiving grants

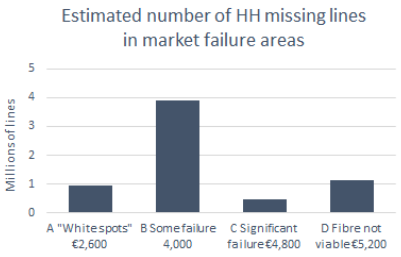
In addition, BGK reduced the allocations to the loan instrument to €145m and allocated the remaining amounts of €105m to a new guarantee instrument addressing the same market. This instrument is simpler to administer for the bank providing the loan, as there is no detailed check required for the eligible expenditure. The maximum guarantee has been extended to 20 years and the guarantee is provided without guarantee fees.

This should allow almost 100,000 final clients to have access to broadband.

d. Public financial interventions should be concentrated on supporting the early project development phases and/or investment in the most rural areas.

According to the EC study "Supporting the implementation of CEF2 Digital"[39] run in 2019, fibre investment unattractiveness is concentrated in 200 NUTS3 areas, **but more significantly in 50+ of them.**





[39] https://op.europa.eu/en/publication-detail/-/publication/8947e9db-4eda-11ea-aece-01aa75ed71a1/language-en

Description	A No market failure	A With "White spots"	B Some failure	C Significant failure	D Significant failure (fibre not viable)	Total
Estimated number of NUTS3 areas	1.145	**80**	**72**	**17**	37	1.351
Estimated number of Member States	28	**15**	**6**	**4**	4	28
Estimated number of HH missing lines	66,405,538	**951.937**	**3.897.043**	**462.486**	1.125.093	72.842.097
%	91.5%	**1%**	**5.3%**	**0.6%**	1.6%	100%
Estimated number of SED missing lines	192,570	**19.539**	**26.466**	**5.293**	7.094	250.962
%	76.5%	**8%**	**10.5%**	**2.1%**	2.8%	100%
Estimated investment required	€172.3b	**€2.5b**	**€16.2b**	**€2.2b**	€5.9b	€199b
Estimated investment per H. Passed	€2,600	**€2,600**	**€4,000**	**€4,800**	€5,200	€2,700
Estimated funding gap	-	**n.a**	**€7.4b**	**€1.4b**	€13.4b	€22-23b

Market failure areas (8.5% of HH and 23.4% of SEDs missing lines)

Figure 51. Fibre investment unattractiveness (market failures) in the EU in 2019

Public funding cover today a large spectrum of interventions to tackle market failures due to some broadband investment unattractiveness.

A digital infrastructure project can be seen as of 4 successive phases:

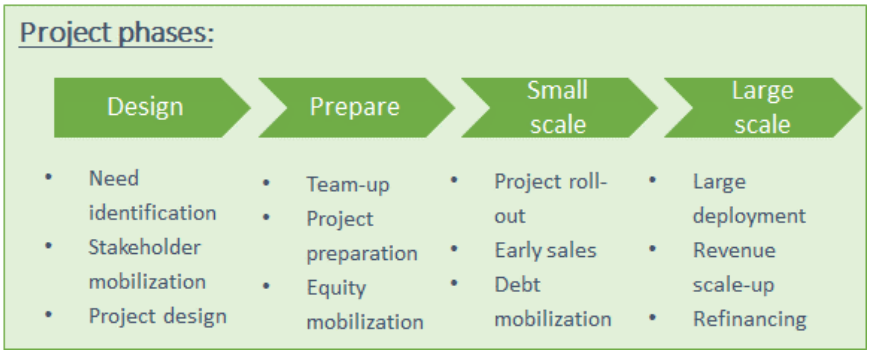


Figure 52. Four project phases of infrastructure projects

- The **'design phase'** is usually run by local/regional/national public authorities that identify a project need and will mobilize different stakeholders leading to a project design. Although, some private investors ('project developers') could also sometimes initiate this phase and work together with public authorities to complete the design.

- The **'prepare phase'** consists of mobilizing a team and of preparing the project in detail, leading to a business plan and to an first round of equity mobilization. Some banks may support the project as well but at a very limited scale as the project is at an early stage. Public authorities may back this phase through some project guidance and business connections.

- The **'small scale phase'** is usually a first network roll-out (a few tens of thousands of homes) financed through equity, leading to early sales and paving the way to more debt funding.

- The **'large scale phase'** corresponds to large deployments (hundreds of homes passed). The revenue scales and the project can be refinanced in different waves (both equity and debt).

Public funding supports cover a wide spectrum of interventions, with now a new focus through CEF2 Digital on strategic infrastructure projects in the EU: Cross-border 5G corridors (CAM), international backbones of strategic importance (e.g., HPC and submarine) and 5G smart communities.

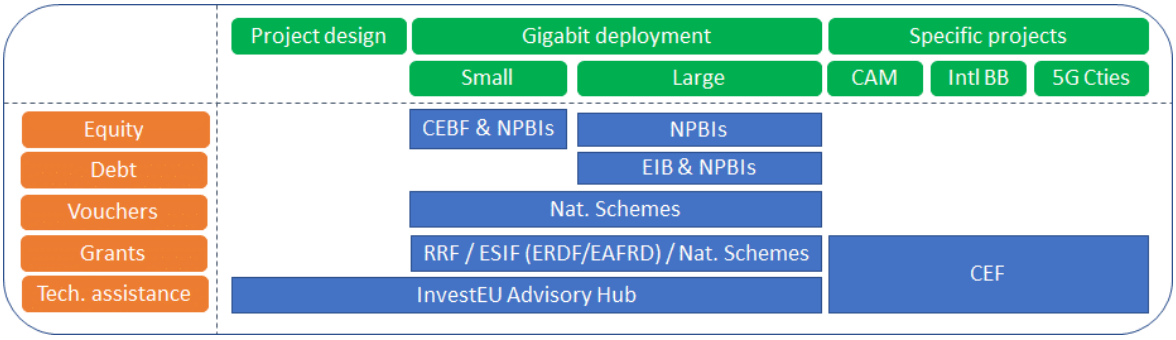


Figure 53. Spectrum of public funding support in the EU

These interventions target to improve overtime project cashflows and/or the financing potential

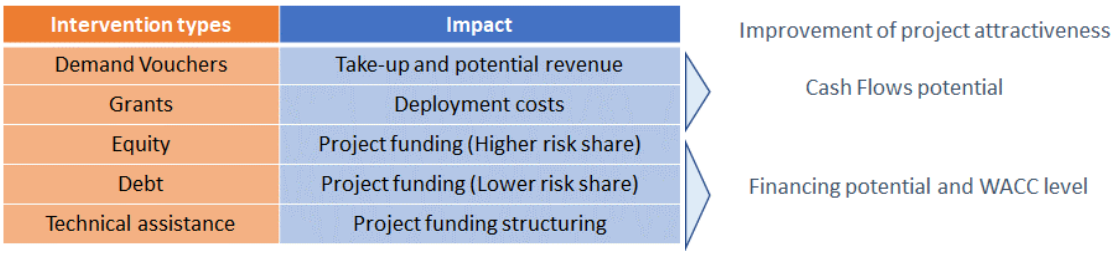


Figure 54. Impact of public intervention types

EU available funding amounts to de-risk projects are massive and until now, grants represent the main part of EU (and National/Regional) interventions.

Recovery and Resilience Facility (RRF)	European Regional Development Fund (ERDF)	European Agricultural Fund for Rural Development (EAFRD)	Just Transition Fund	Connecting Europe Facility – Digital (CEF)	Connecting Europe Broadband Fund (CEBF)	Invest EU -Sustainable Infrastructure Window
Grants/Loans	Grants/Loans	Grants/Loans	Grants/Loans	Grants	Equity	Financial Instruments
€723.8 bn (20+% digital)	€215.2 bn	€95.5 bn	€19.2 bn	€1.8 bn	€555m	€9.9bn

Figure 55. EU available funding amounts[40]

Public financial interventions should be concentrated on projects with the highest risk level

When considering the two major risk dimensions of an infrastructure project (i.e. the project phases and the targeted area), **the most risky situations are in the early phase of the project (Design, Prepare, Small scale) and the most rural/remote areas (Areas C&D).**

[40] Source : EU funding for broadband 2021-2027
https://digital-strategy.ec.europa.eu/en/library/eu-funding-broadband-2021-2027

Other do not require much public support and should be warmly encouraged to fully leverage private funding.

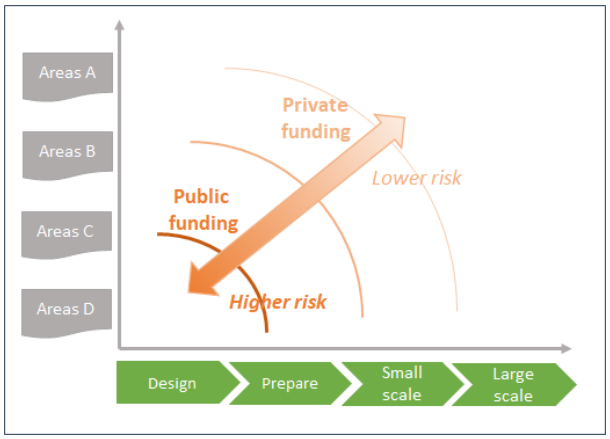


Figure 56. Public intervention according to the risk level

The *Design* phase should trigger the emergence of "investment-ready" projects

Some European rural municipalities/regions are **still missing some key skills and necessary funding**, which prevents them from triggering, organizing, designing digital infrastructure projects in their areas. This could include demand awareness, technical skills, project development know-how, funding for preliminary studies, capacity to increase the project size, connections with investors …

Several key public initiatives could be developed:

Public stakeholders	Potential support initiatives
European Commission / National Authorities	• National and EU support from Broadband Competence Offices
National Authorities / NRAs	• Organizing regional projects (gathering multiple municipalities)
European Commission (Invest EU Advisory)	• Provide technical assistance from infrastructure project experts
National Authorities / NPBIs	• Introduce project developers (equity/debt investors…)

Figure 57. Potential public initiatives to support the 'project design' phase

The first one could be conducted by the European Commission and National Authorities through the support given by the **Broadband Competence Offices** to guide public authorities and project promoters to develop their projects.

National Authorities and NRAs could also act towards **the organization of projects with large areas by gathering multiple municipalities** into one single project. The **InvestEU Advisory Hub** from the EU Commission can also provide technical assistance from infrastructure project experts. The National Authorities (and possibly the NPBIs) could introduce **some project developers** (equity or debt investors) to municipalities and regional authorities in order to support their project design.

All these initiatives could back local authorities with **best practices and technical assistance**.

The *Prepare* phase should foster the emergence of "project-qualified" teams

According to interviews, even without a clear list, there are probably **less than 50 entrepreneurs** on small scale projects (20,000-100,000 HPs) in the EU, which is very limited considering the investment gap and the demand for deployment projects.

Some skilled individuals (e.g., coming from telecom operators and/or equipment vendors) **could step in entrepreneurship of digital infrastructure projects**. Although, it would require them:

- to leave their job, to be without any salary for years and to invest time and energy
- to learn how to set-up / run a project, to set-up a complete skilled team, to attract funding

These challenges **prevent small size projects** in rural areas **from being developed** as soon as possible.

We propose **the creation of a *Broadband Academy*** by the European Commission through the BCOs:

Public stakeholders	*Broadband Academy* initiative
European Commission Through the BCOs + successful entrepreneurs	• Call for projects in rural areas (cf *Connected Communities* call) • Screen project ideas submitted by start-ups/SMEs • Select a list of project promoters for a coaching over several months • Provide a financial support via a voucher scheme (living costs) • Expose selected promoters (when ready) to private investors

Figure 58. Broadband Academy initiative

The Broadband Academy would be **run by the Broadband Competence Offices** (coordinated by the BCO Support Facility in Brussels) and be backed by already successful entrepreneurs.

It could be organized through **a call for projects** (such as the *Connected Communities call* [41] in 2015, where project ideas would be submitted by start-ups/ SMEs and screened by a jury that would select a list of project promoters who would receive **a coaching programme over several months**.

A financial support in the form of **a voucher scheme** could be introduced to cover parts of the living cost (and/or potentially partially invested in the project). At the end of the coaching programme (or before, when ready), selected project promoters could **be exposed by their coach to private investors**, possibly through EU Commission events.

[41] https://digital-strategy.ec.europa.eu/en/news/connected-communities-initiative

We believe that this initiative could **double the total number of skilled entrepreneurs in 2 years**.

The '*Small scale*' phase should financially support the development of start-ups

To start a project, a promoter **needs to mobilize enough money** (mainly equity):

- to gather and pay a team and contractors
- to demonstrate to equity investors its ability:
  - to roll-out a project on a small scale
  - to commercialize it efficiently
  - to meet financial targets that would enable a refinancing

The required money support (up to dozens of millions of euros) **prevents small scale rural projects to be developed at a minimum size for scaling** (ultimately over 100,000 HPs).

The European Commission has developed in 2018 the **CEBF initiative that we propose to reinforce**.

Public stakeholders	*CEBF* initiative
European Commission through CEBF	• Network of senior advisors with a deep knowledge of local markets • Supports early-stage projects with a min. capital and a co-sponsor • Sweat equity of €5m to €30m with accretion on milestones • Potential additional support to cash-poor projects through a grant to the entrepreneur.

Figure 59. CEBF initiative

In the CEBF initiative, the European Commission has already developed a network of senior advisors with a deep knowledge of local markets and **supports early-stage projects** with a minimum capital and a co-sponsor **through a sweat equity from €5 to €30 million** with accretion on milestones.

We propose to reinforce this initiative:

- by increasing the fund to support selected *Broadband Academy* entrepreneurs
- by providing a complementary project grant (or a forgivable loan) to the entrepreneur
- by extending the support to CEF2 specific projects (like backbones and/or 5G communities)

The '*Large scale*' phase should incentivize developments of large and complete areas

As they are often organized at municipality level, initiatives for broadband projects can be scattered and poorly coordinated at a regional or national level.

Figure 60. Illustration of a divided area regarding cost per HP

As an area can be composed of various spots with diverse cost per Home Passed, project promoters **tend to address them one by one**, starting usually (but not always) with the lowest Cost per Home Passed, and possibly finally leaving behind the less profitable sub-areas (e.g., remote homes).

It results a dispersion of efforts, a lack of homogeneity generating **a possible local digital divide**.

We recommend National Authorities and NRAs **to favour approaches with large and complete areas targeting ideally hundreds of thousands of Homes Passed.** The benefits are the following:

- For investors:
  - **Financial risk mitigation** amongst areas (averaging of costs but also of take-up rates)
  - **Economies of scale** (Sales & Marketing, Permits & roadworks, Network design, …)
  - **Easier access to funding** as it creates opportunities for exposure of larger amounts
- For public authorities:
  - **No white spots** to target later (no local digital divide)
  - **Less dispersion** with one single project to support

It would require neighbouring municipalities to get together and to put their resources in one common project, which could be difficult in some cases considering political differences or egos. **The influence or the monitoring of a national authority/NRA could ease** the emergence of these kinds of projects.

In *'Deep rural'* areas, industrial synergies will need to be developed, leveraging various possible technologies, and backed by a tailor-made public support

As exposed in an EIB paper from J Hätönen[42], Costs par Home Passed (HP) are highly dispersed according to the European population density. Even if costs might have been reduced since 2011, rural and deep rural areas (< 80-100 inhabitants par km2) could represent **15 to 20% of EU households**.

[42] https://www.eib.org/attachments/efs/eibpapers/eibpapers_2011_v16_n02_en.pdf

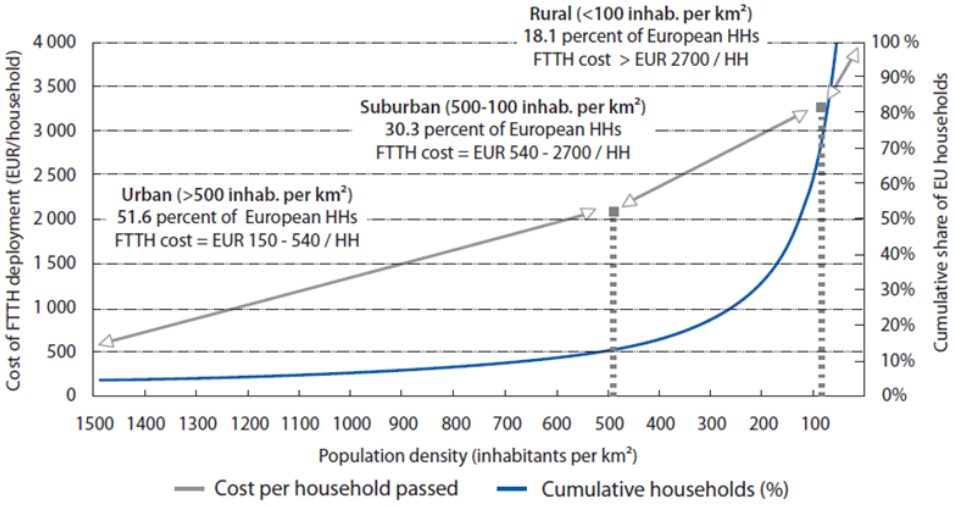


Figure 61. Cost of fibre deployment per household and population density in the EU
(Source: Hätönen, EIB Papers 2011)

Coverage of premises in white deep rural areas could be realised through **a wide range of technologies (FTTH, FWA, 5G and Satellite)** than can provide speeds above the minimum requirement of 100 Mbps set by the 2030 Digital Compass:

- FWA operators have solutions **providing up to 100 Mbps** through millimetre waves**. Eolo in Italy now plans to reach 300 Mbps using a 5G radiall solution** with a 4km radius. FWA technology is flexible in its deployment. Its **success-based CAPEX** varies according to the number of customers and can benefit from cost synergies with operators at the tower level.

- **5G mobile is also an option** that would leverage the current deployment by MNOs. Although according to interviews, in such case, the radio resource is shared amongst customers which could limit the QoS offered to the end-user.

- Satellite can be another option to deploy ultrafast broadband in deep rural thanks to Eutelsat KONNECT and KONNECT VHTS satellites that optimise end-user throughput through continuous improvement of satellite technology, **reaching speeds of up to 200 Mbps**. In the next 10 years, the generations of LEO satellites could also further improve speeds and latency.

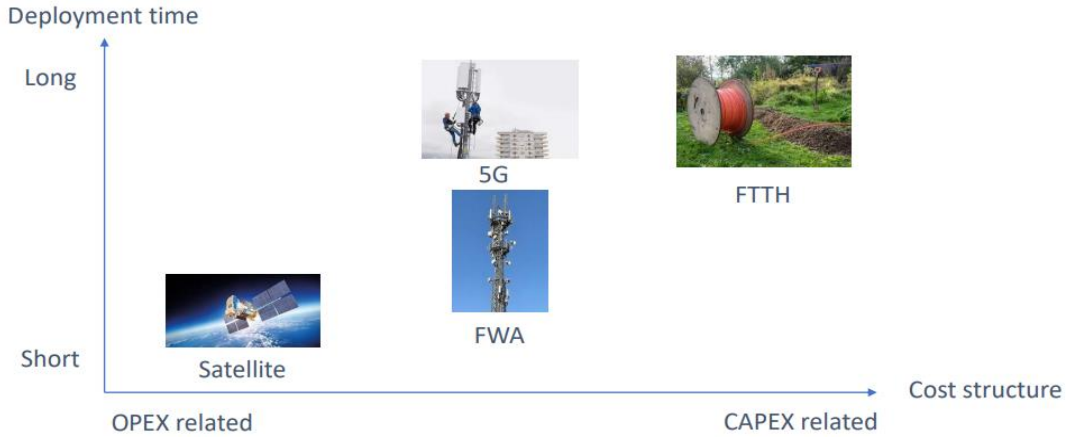


Figure 62. Comparison of available technologies for Deep Rural

When comparing these different technologies, **FTTH takes more time** to be deployed and requires CAPEX, when **satellite is immediately available** and only requires OPEX to be operated (besides the end-user equipment). FWA and 5G are in the middle as they require **variable capacity CAPEX**.

Despite "high investment-long deployment" position, the investment in fibre from a long-term perspective (over 20+ years) **could be far more cost efficient** than the other options as it will potentially reduce the OPEX and provide a very long-lasting technology.

Deep rural FTTx projects **will hardly be attractive** to private investors as:

- **take-up rates** in these areas could be limited (low demand)
- **potential ARPUs** can be low (unfavorable socio-economic factors)
- **costs per Home Passed** will be quite high (dispersed homes, difficult topology)
- public authorities could miss **the right tools** to design/support projects

In such case, we recommend a tailor-made innovative support from public authorities, specific for each particular situation, made of three pillars:

- **Create industrial synergies among players** by (1) exploiting possible deployment extensions from neighbouring areas (FTTH, MNOs, Towercos…) and (2) leveraging all the legacy infrastructures and deployment initiatives into one global project.
- **Ensure a revenue protection to the investors** by (1) committing on a subscription revenue level from public stakeholders (admin buildings, hospitals, schools…) and (2) providing long engagements (30+ years) under a protective contractual and regulatory framework.
- **Close the funding gap** through (1) significant infrastructure grants/vouchers for FTTH (2) potentially direct public investment (e.g., passive infrastructure) and (3) satellite vouchers for extreme remote areas

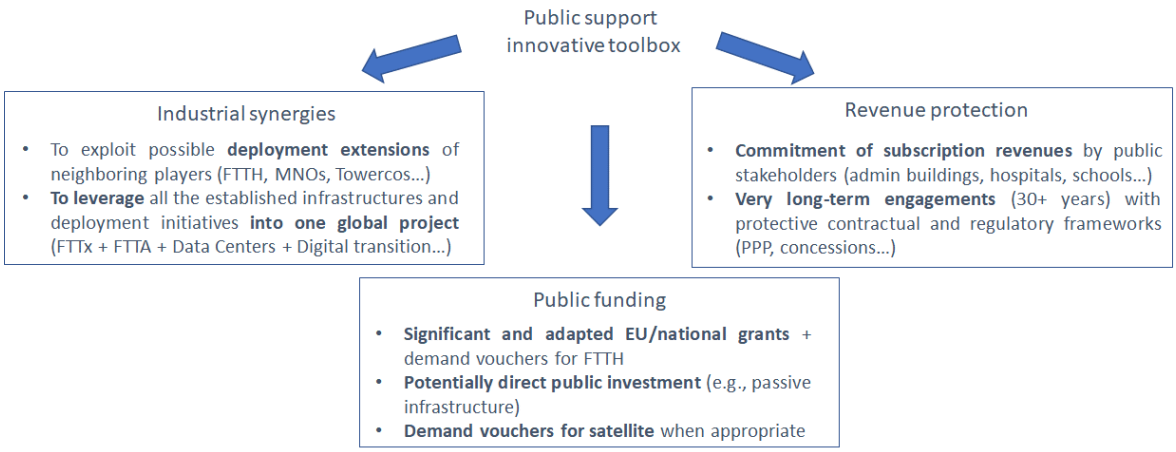


Figure 63. Public support innovative toolbox

Verbatims

- *"Mobile operators can also provide a solution for homes through a wireless-connected box. Although only FWA, being a fixed service, can strictly monitor the*

number of customers and hence a minimum quality of service. This FWA technology could be expanded in other European countries."

- *"FWA is fit for countries with situations like in Italy with a lot of villages and homes largely scattered. Spectrum management is a crucial issue for FWA operators. NRAs should devote a substantial part of the millimeter wave spectrum to FWA exploitation to guarantee relevant technical and economical solutions to rural and remote areas."*
- *"Considering the necessary significant end-user investment (around €400), we consider that satellite connectivity requires some public funding through connectivity vouchers to increase subscriptions. We believe that regarding satellite (as opposed to terrestrial technologies), it would make more sense to organize the public funding support at a European level (as in the US or in Australia). Eutelsat would expect local public authorities to define clear areas or spots where fiber deployment will not be supported financially because too expensive, in order for the market to have a clear idea where satellite should be expected as an alternative."*

8. RECOMMENDATIONS ON INVESTOR NETWORKING SCHEMES

Regarding broadband, public authorities at an EU and at a regional/national level have developed and apply a set of policies (political, regulation, funding, guidance, and support).

This structures already well the broadband deployment ecosystem, but we believe that considering the immediate €250+bn funding gap and in the light of the 2030 targets, public authorities should also **have a role to play to develop fruitful connections** between project promoters and investors

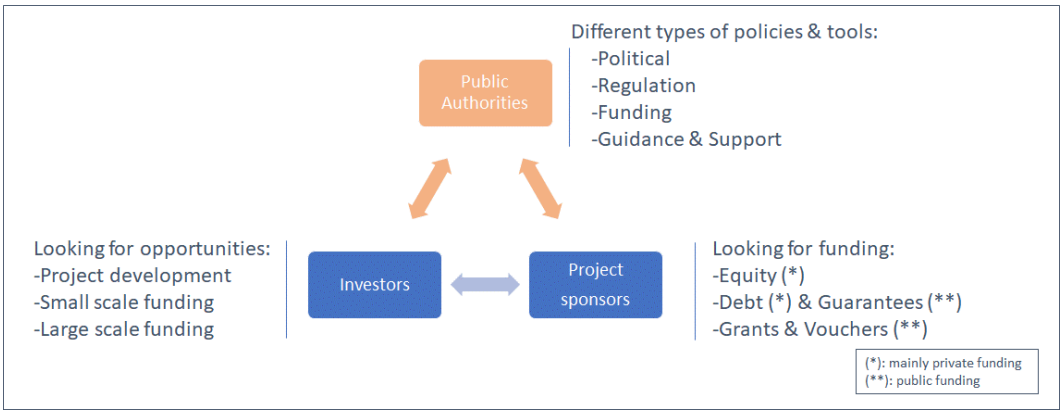


Figure 64. The broadband deployment ecosystem

It would also be an opportunity for public authorities at an EU and a regional/national level **to assess the investment attractiveness** of their rural areas, **to identify roadblocks** to a large broadband deployment and **to potentially adjust their policies** to "fluidify" the infrastructure investment market.

a. The set-up of the European Innovation Council by the EU Commission can be a source of inspiration for how to associate EU broadband investors.

Within the EU Horizon Europe programme, the European Commission has set up in 2021 the European Innovation Council **to identify and to support breakthrough technologies and game changing innovations** to create new markets and to scale up internationally.

The European Innovation Council provides **public funding opportunities** at different innovation development stages but also **mentorship and coaching support** to promising companies. Through a dedicated fund (EIC fund), it can **also directly co-invest** in companies together with private investors.

The strategy and implementation of the EIC is **steered by the EIC board**, which has independent members appointed from the world of innovation (entrepreneurs, researchers, investors, corporates and others from the innovation ecosystem). The EIC and the SME Executive Agency is responsible for supporting the EIC board and for implementing the EIC's activities.

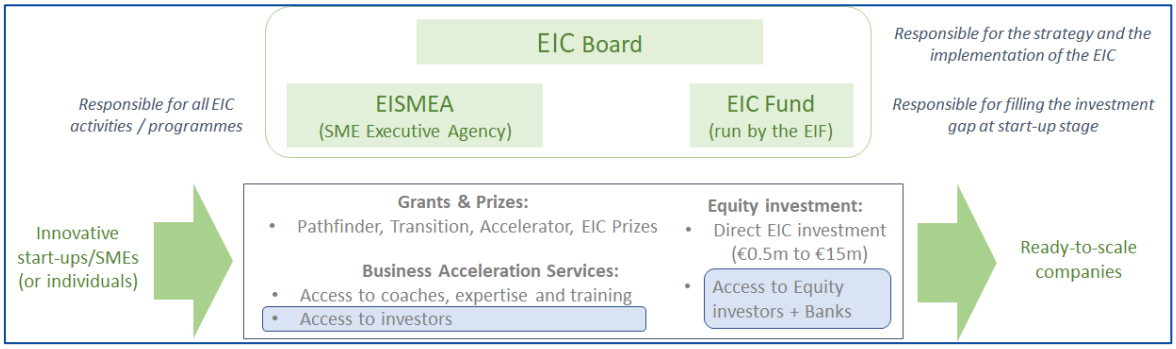


Figure 65. The European Innovation Council

A parallel could be made between innovation activities and digital infrastructure deployment activities, since **they all grow in three phases** from 'design and preparation' (Stand-up), to 'small scale development' (Start-up), and finally to 'large-scale development' (Scale-up).

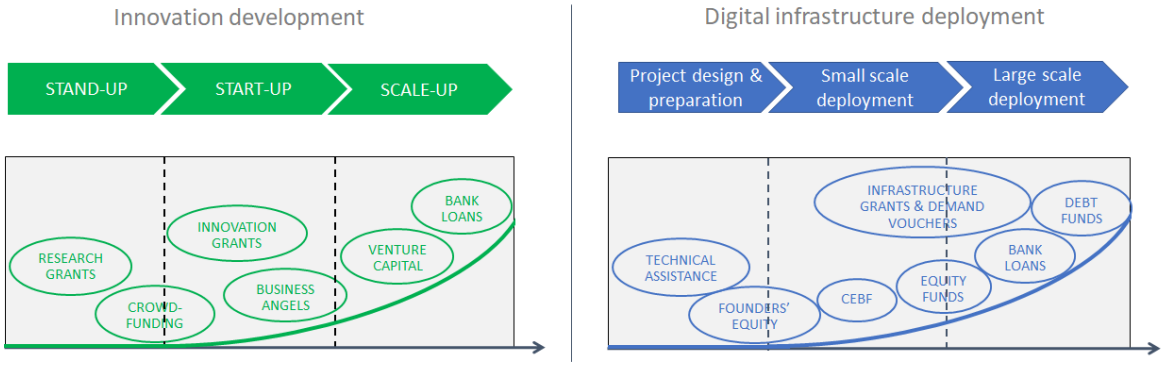


Figure 66. Comparison of development phases in innovation and digital infrastructure

Even if the funding size (from millions on one side to billions on the other) the investment time span (a few years to decades) and the various funding tools can be different at each

phase, the structure and the activities develop by the EIC to make projects emerge, start and grow **could be inspirational**.

As examples, the EIC has successfully developed:

- An EIC board gathering all kinds different ecosystem stakeholders, including investors
- Public funding programmes to bridge the gap to private investment
- Coaching programmes and investment-readiness trainings for companies
- Networking events between companies and investors
- A regular feeding of the InvestEU & the Euroquity portals that connects projects and investors
- An EIC fund that directly invest in companies and invites VCs to co-invest

b. An "EU Broadband Investment Advisory Committee" could gather all investor types to regularly share views on the EU broadband investment status.

Considering the EU Commission's clear and ambitious targets for digital Infrastructure by 2030 *("all European households will be covered by a Gigabit network, with all populated areas covered by 5G"*), there is a need **to mobilize all kinds of private investors** in order to better address the underserved areas, possibly leveraged by EU and national public funding and financial instruments.

For that objective, DG CNECT could **gather in a unique forum** on a regular basis (e.g., every six months) **the various kinds of private investors** to share the situation of broadband investment in Europe, to identify challenges and opportunities and to fine-tune the various public policy tools in that matter (political, regulation, funding, guidance & support).

We would imagine having **one representative per investor group**, which could be from an investor association or an industry association, or even a qualified individual. In order to mix various points of view and experiences, representatives could be **rotating regularly** (every 6 months or every year).

We recommend 7 investor groups with each specific profiles:

- Equity investors
- Debt investors
- Banks
- Towercos
- EIB and NBPIs
- Telcos
- Towercos
- Infra Start-ups

In order to bring more value to the discussions and to get more impact in potential policy fine-tunings, we recommend **to embark representatives from 3 key stakeholders regarding broadband investment**: the Committee of Regions, the BEREC and the Broadband Competences Offices. They could give a voice but could also take in consideration the investors' points of view for their field.

The regular meetings of this committee could also be backed by **an annual survey on the investment climate** addressed to all the investor community. A mock-up is proposed in the appendix.

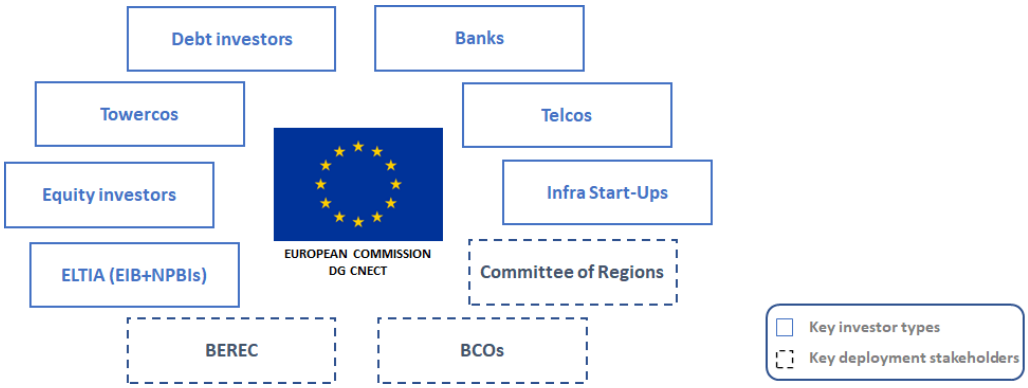


Figure 67. EU Broadband Investment Advisory Committee

c. There could be three complementary ways to generate at an EU level fruitful connections between project promoters and investors.

Following the various successful instruments developed by the European Innovation Council, we recommend:

- To develop **a specific Broadband Investment Portal** that will be the entry point for investors, project promoters and public authorities to the InvestEU portal and the InvestEU Advisory Hub.

  The objective will be to provide all kinds of useful information regarding the broadband investment market:

  - For Investors: **Country profiles** including infrastructure mapping, key contacts (BCO, NRA, agency for foreign investments, agency for economic development,…), key local active investors (Banks, NPBs, Telcos, …), key points about national telecom regulation and investment regulation, …

  - For project promoters and public authorities: **Investment tools** such as a presentation of the various EU programmes (RRF, ESIF, CEF, CEBF,…) and a link to the Fi-compass website[43] , private funding tools (equity, quasi-equity, debt, grant,…) and investment cases and some case study materials from the Broadband Competence Offices,…

[43] https://www.fi-compass.eu/

Project promoters and investors could feed the InvestEU portal with their respective profiles, whereas the Advisory Hub could help to assess and to orientate projects towards investment.

- To set-up **an annual investor conference**, potentially within the 'Broadband Days' with debates around the role of private investors and networking between private investors, public authorities and project promoters. It could also be an opportunity of showing real cases, blended operations, exploitation of financial instruments, investment cases by CEBF…

- To develop **investment-readiness trainings** inside the *'Broadband Academy'* initiative (see 7.4) through the Broadband Competence Offices. After a strong selection of promising project promoters, the beneficiaries might receive trainings through webinars, workshops, coaching, mentoring … After a few months, when fully ready, they could be exposed to investors and be invited to pitching sessions in front of an investor panel.

All these initiatives could globally **boost the level of awareness** on both sides of the 'broadband investment market' and **ensure a fruitful dialogue** between project promoters, private and public investors and EU and national public authorities.

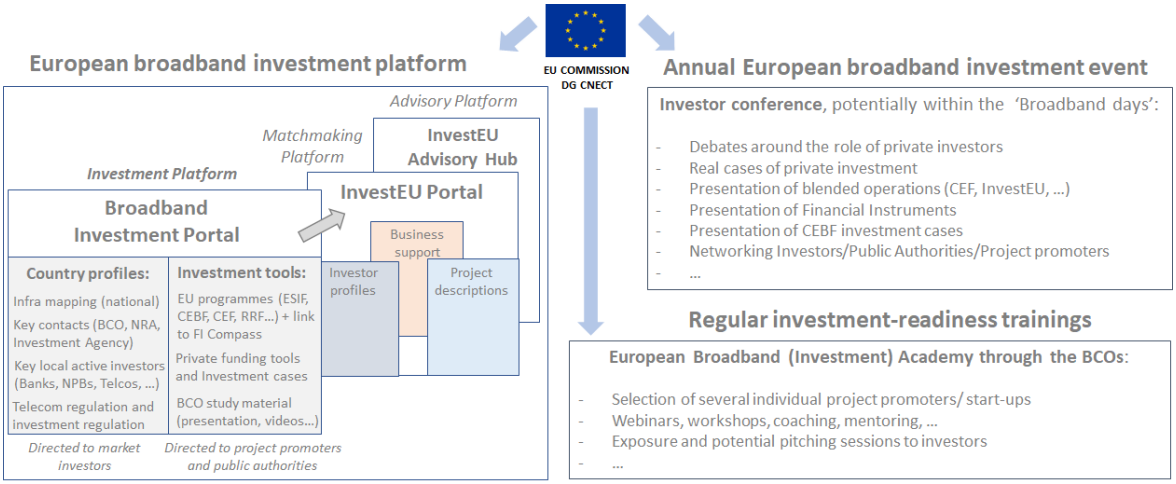


Figure 68. 3 initiatives to improve connections of promoters with investors at EU level

d. The development of regular networking events at a national level could be instrumental to trigger and to accelerate investment in member states.

We recommend to develop **national networking events** between investors and project promoters under the co-management of the **Broadband Competence Office (BCO)** and the **Agency for Economic Development (AED)**. They could provide complementary views on the country's situation: The BCO could present the telecom market and telecom regulation and make a link towards project promoters and public authorities whereas the AED could introduce the investment regulatory framework and be connected to international investors and local stakeholders (NPBs, Banks…).

National networking events could gather **all kinds of national investors** (including NPBs, that are usually Invest EU implementing partners) **and international investors** with **project promoters and national public authorities**. Some local or financial experts could join as well, to provide some technical assistance and some consulting support.

The objective would be in particular to guide and support **the 'design' and 'prepare' phases**, **to** generate investments in **small scale projects** and to ensure long-lasting business connections.

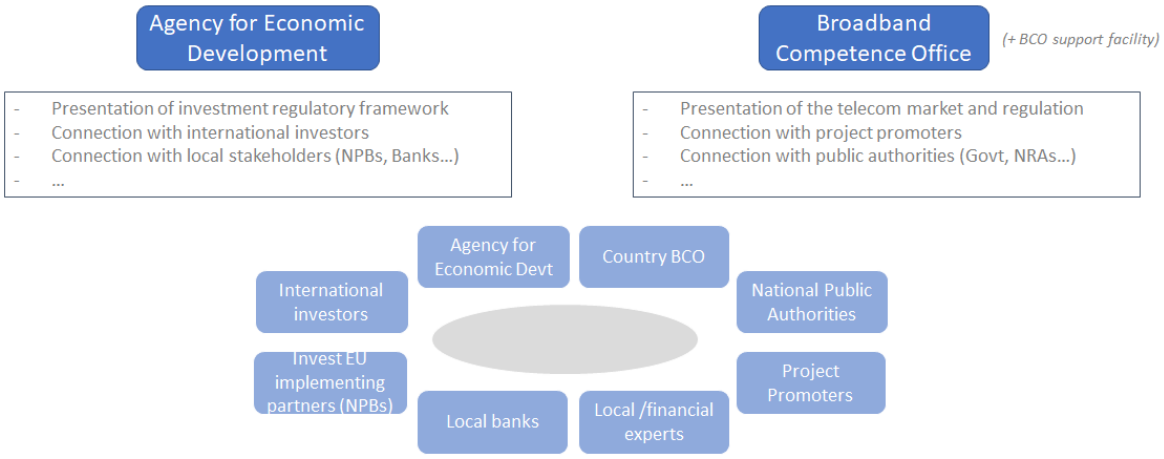


Figure 69. Framework for National Broadband Investment networking events

APPENDIX

Mock-up of an annual survey on the investment climate

We have developed a mock-up of an annual survey on the investment climate that could cover seven major topics:

- **The financial landscape**, i.e., how favourable is the current financial climate
- **The investment-friendliness**, i.e., how favourable is the political/regulatory context
- **Projects' availability, visibility, investment-readiness**, i.e., how many opportunities
- **Roll-out barriers**, i.e., how difficult is the exploitation of deployment opportunities
- **Long-term risk for FTTH investment**, i.e., what risks could prevent long-term investment
- **Urgent actions to increase private investment in FTTH**, i.e., how to prioritize actions
- **Deep rural and remote areas**, i.e., what actions should be developed in these areas

We believe that many questions could be further refined through early feedback from a limited number of investors. The next 'Broadband days' (2022) could be an opportunity to test the survey in vivo with a few dozens of investors if they could be invited for that event.

Survey on the investment climate

A. Financial landscape

1. How would you rate the current climate for infrastructure investment?

2. How is this financial climate likely to positively evolve in the next 3-5 years?

3. How would you rate digital compared to other infrastructure opportunities?

4. Which factors could influence the financial climate in the next 5 years?

B. Investment-friendliness

5. How would you rate the political/regulatory support given by the European Institutions to provide a long-term visibility in the sector?

6. How would you rate the support of national/regional authorities to deployments?

7. How important are grants in your future investment decision-making?

8. How much State Aid constraints influence your decision-making?

9. Which factors could influence your investment in digital infrastructure in the EU?

C. Projects' availability, visibility, investment readiness

10. How would you rate the availability of projects for investment in the EU?

11. How would you rate the visibility of these projects to investors?

12. How would you rate the investment readiness of these projects?

13. Which factors could improve the availability, visibility, and investment readiness of deployment projects?

D. Roll-out barriers

14. How would you rate the support given by municipalities/regional authorities?

15. How would you rate the Broadband Cost Reduction Directive enforcement?

16. How much shortage of workforce affects deployments?

17. How much unfair practices from incumbents/large players affect your deployments?

18. Which visible and hidden barriers could negatively affect your deployments?

E. Long term risks for FTTH investment

19. How would you rate the risk of new competitive technologies (e.g., 6G)?

20. How would you rate the risk of excessive funding gaps in future projects?

21. How would you rate the risk of decreasing returns due to price regulation?

22. Which long-term risks could limit or prevent your future FTTH investments?

F. Urgent actions to increase private investment in FTTH projects

23. What would be the most urgent actions from public authorities to improve private investment in digital infrastructure in the European Union? Ranking

- Limiting the risk of overbuild
- Limiting the risk of unfair competition from legacy
- Supporting the development of small project promoters
- Supporting public authorities in making projects “investment-ready”
- Providing support and guidance to trigger projects at a larger scale
- Enforcing BCRD
- Setting up clear timely targets for copper switch-off
- Providing infrastructure grants
- Providing connectivity vouchers
- Providing other funding means (Guarantees, Debt…)
- Other:

G. Deep rural / Remote areas

24. What are the most relevant actions to accelerate gigabit deployment in deep rural? Ranking

- Providing infrastructure grants to FTTH projects
- Securing millimetre spectrum to FWA operators
- Providing grants to tower building projects
- Reinforcing coverage obligations for 5G operators
- Providing connectivity vouchers for satellite service
- Other:

25. Do you consider investing in 5G passive or active infrastructure in rural areas?

Low 1 2 3 4 5 6 7 8 9 10 High

26. What are the reasons that prevents you from investing in 5G infrastructure?

27. Do you consider investing in LEO satellites for connection in rural areas?

Low 1 2 3 4 5 6 7 8 9 10 High

Additional comments and particular recommendations about this survey

Minutes of the December 7th, 2021 workshop

On Tuesday 7 December 2021, the provisional conclusions of the study were presented in a full-day online workshop chaired by Daniel KITSCHA, Deputy Head of Unit, DG CNECT B5 *"Investment in High-Capacity Networks"*. The event organised by the study team was attended by 132 participants including private and public investors (equity and debt funds, banks, telcos, towercos, projects promoters, NPBIs…), public authorities (national public authorities, BCOs, NRAs) and the Commission services.

Roundtable on Equity investment

Moderator: Christophe Bodin, CBO Consulting

Speakers: Vauban IP: Gwenola Chambon, CEO; EQT: Gleb Kozyritskiy, Managing Director; Macquarie MacCap: Olivier Bradley, Managing Director, Skandia Mutual Life Insurance: Hans Fredrik Forssman, Senior Investment Manager Infrastructure; Eurazeo: Laurent Chatelin, Partner

Key messages:

Over the years, digital infrastructure has gradually been perceived as less and less risky.

Ten years ago, infrastructure investors expected a double digit RoI. Today, it is more a high single digit. Gwenola Chambon, explained this phenomenon by the growing demand by end-users of resilient digital infrastructure assets, which finally make high-capacity networks an essential community service, a utility such as gas, electricity, or water.

The market is ready to massively invest in digital infrastructure assets.

Oliver Bradley explained that investors have large amounts of equity to invest in the market. He also indicated that subsidies are not really required at this stage. Investors would prefer regulatory support to better operate with municipalities to avoid any red tape and construction delays and to better manage the local competition

Investors recommend the implementation of clear regulatory frameworks at national level.

Panelists agreed that stable and transparent national regulatory frameworks would incentivize private investment in digital assets, by providing visibility and stability therefore lowering the risks for equity investors. Best practices such as the French market organization (*Plan France Très Haut Débit*) should potentially be promoted by the European Commission around Europe.

Local municipalities are key stakeholders to accelerate projects across Europe.

Gleb Kozyritskiy specifically indicated that the role of municipalities should be (1) to limit overbuild and (2) to accelerate construction permits for the benefit of project development.

Roundtable on Project funding

Moderator: Christophe Bodin, CBO Consulting

Speakers: Altitude Infrastructure (FR): David Elfassy, President; CETIN (CZ): Michal Frankl, Business Support Director; RuNe (SI/HR): Goran Zivec COO, nöGIG service GmbH (AT): Igor Brusic, Vice-President; Grand Est Region (FR): Franck Siegrist, Director for Digital Development.

Key messages:

Wholesale concession models can guarantee a win-win partnership between public authorities and private investors.

Franck Siegrist highlighted that the wholesale concession model set up by the Grand Est region successfully attracted private investors for 100% of targeted rural households (400,000 in Rosace by end-2021 and 1 million in Losange by end-2022) while lowering the public funding contribution (from 80% to 36% for Rosace and from 60% to 15% for Losange).

The French regulatory framework has successfully attracted investors and accelerated FTTH.

David Elfassy expressed that the French national regulatory framework has created a virtuous circle to build and to develop resilient FTTH networks across the country, because:

- It reduced the overbuild risk by developing one wholesale network per region,
- It established clear connectivity targets per type of density areas,
- It brought certainty and visibility lowering the risks for private investors,
- It favored the re-use of legacy infrastructure to reduce the construction costs.

Through this regulatory framework, national players have emerged to deliver cost-efficient infrastructures with limited (or even without) public funding.

Project attractiveness relies on the CAPEX per HP, the size, the team and the expected ARPU.

Goran Zivec, as well as Igor Brusic, indicated that projects with a cost per HP below €2,000 will usually be attractive to investors. Goran Zivec explained that the bigger the project and the higher the investment attractiveness. According to him, currently in Europe, only projects above €100 million are attractive for investors and smaller projects (around €5 to 10 million) will not be able to approach private investors – or only through specific instruments such as

the CEBF initiative. He also highlighted that the ARPU is a key parameter for investors and explained that investors have targets per country. Finally, he explained that investors will only invest if the managing team gather all the required knowledge and skills (technical and business) to roll-out an FTTH network.

Project promoters need technical assistance.

Goran Zivec recommended that public authorities develop an instrument or a measure to provide technical assistance to project promoters across Europe. He also proposed that EU/national public authorities could implement a “dictionary” and/or a “repository of best practices” to support project promoters, by defining key technical/business terms (i.e., Home Passed) and to detail the different steps of an FTTH project, in order.

A limited of players can provide more roll-out effectiveness at national level.

Michal Frankl indicated that in Czech Republic telcos are more 600 across the country. This multiplies the number of local projects which increases the risk of overbuild and complexifies the design and the monitoring by public authorities. It has also negative consequences on the delivery of permits and therefore on construction delays. In that context, Czech Republic would hardly meet the 2030 Digital Compass connection targets.

Roundtable on Debt financing

Moderator: Christophe Bodin, CBO Consulting

Speakers: Axa IM: Bertrand Loubières, Head of Infrastructure Finance; HCOB: Steffen Leiwesmeier, Head of Financing Digital Infrastructure; EDRAM: Ada Cerne, Head of Digital Infrastructure, SGCIB: Laurent Chabot, co-head Infrastructure Finance.

Key messages:

Digital is now a core asset for debt infrastructure investors (bank and debt funds)

According to Bertrand Loubières, business models can now provide strong opportunities of long-term cash flows to infrastructure investors. Ten years ago, it was quite challenging to finance digital infrastructure assets due to the lack of market references. In the last years, the multiple financed projects have successfully helped debt investors to better assess the market and triggered larger investments in early-stage projects.

Laurent Chabot highlighted that the recent COVID crisis has ramped-up the digital infrastructure asset market and increased the appetite of investors.

The take-up ratio, the level of competition and the stability of the national regulatory framework are key parameters for debt investors.

Steffen Leiwesmeier expressed that debt investors like to invest in early-stage SMEs when they have a strong managing team and a solid business plan. Ada Cerne presented what she considers as the most positive criteria for a successful debt investment:

- A strong take-up ratio (high demand from consumers),
- A market opportunity for new entrants (e.g., limited presence of the incumbent),
- A possible de-facto monopoly (e.g., through a concession model),
- A clear regulatory framework.

These criteria represent drivers for a long-run growth and generate investment attractiveness.

Debt investors recommend that public authorities establish clear regulatory frameworks.

Ada Cerne recommended public authorities to be inspired notably by the French, Italian and Dutch regulatory frameworks that are all very clear, and to increase the development of passive infrastructures under wholesale business models. Public authorities should also spread-out best practices across Europe to unlock private investment.

Public authorities should increase the visibility of infrastructure projects across Europe.

Panelists recommend local authorities to make projects more visible, especially in the CEE. Ada Cerne pointed out that a list of pre-validated projects by local sponsors (i.e. VCs, infrastructure investors, banks…) will benefit the investor community and facilitate investments.

Banks and debt funds should be involved in the very first funding rounds.

Steffen Leiwesmeier indicated that banks like to invest in early-stage projects when they set up their first funding round. Ada Cerne added that equity investors and debt investors should work more closely to identify relevant projects across Europe and to invest together.

Roundtable on Deep rural challenges

Moderator: Stéphanie Char, IDATE Digiworld

Speakers: Deutsche Glasfaser: Christoph Sommerberg, Head of Public Affairs; Open Fiber: Edoardo Fagiolini, European Affairs specialist; Eutelsat: Stefano Agnelli, Director of European Institutional Affairs; Cellnex: Shoaib Patel, Innovation Project manager; Vantage Towers: Ralf Capito, Director External Affairs.

Key messages:

Alternative technologies should be considered as complements to FTTH networks.

According to Edoardo Fagiolini, alternative technologies to fiber (notably FWA or satellite) should not be seen as competition. He explained that 100% connectivity could be reached in the coming years backed by public funding, but that it will take time. In the near term, before FTTH connectivity is everywhere, alternative technologies could complement existing FTTH networks by connecting low-density and remote areas.

Public authorities should raise the customer awareness to generate an increased demand

According to Shoaib Patel, 5G FWA is likely to be developed in urban areas (various use cases) but could also be widely spread out in rural areas if public authorities would increase customer awareness, in order to generate an increased demand for high-speed networks. He explained that towercos help operators to reduce the broadband deployment costs through infrastructure sharing, which could go for Cellnex up to an "open hosting" on the active layer backed with a wholesale model approach to operators.

Private investment is central for broadband deployments

Christoph Sommerberg underlined that public authorities should only intervene when public money is required to connect the remaining remote areas.

He also stated that the EU Commission could push member states to provide technical assistance toward local municipalities and governments to ease investment in local projects.

Satellite can efficiently serve sparse demand

Stefano Agnelli explained that GEO satellites can provide already high-speed capacity, for example through Eutelsat Konnect and soon Konnect VHTS. In the coming years, LEO satellite constellations will be able to provide globally even higher quality of service.

Recommendations to the European Commission and Q&A

Presenter: Christophe Bodin, CBO Consulting

Christophe Bodin, Director of CBO consulting presented the study recommendations. It was followed by a Q&A session, opened to all the participants.

Key messages from the Q&A:

Europe is facing an "execution gap" and not an investment gap

According to Christoph Sommerberg, Head of Public Affairs for Deutsche Glasfaser, investors are ready to invest massively in broadband networks across Europe. The issue is not an investment gap but the fact that projects are not able to emerge locally. This "execution gap" relies on the technical ability of local authorities to design and to develop investment-ready projects. Therefore, public authorities and NRAs should encourage municipalities to work together in order to leverage bigger and attractive projects while supporting them with technical assistance.

Private investment should be a priority

Jan Dröge, Team leader of the BCO Support Facility, alerted the EU Commission that public fundings unlocked under the new Multiannual financial framework (CEF, Invest EU, RRF) should not be crowding out private investment in the development of broadband networks. Public funding should only intervene when required and for specific cases such as the connection of remote areas.

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