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# BROADBAND FUNDING MECHANISMS

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## BROADBAND FUNDING MECHANISMS

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### ABSTRACT

This paper reviews funding models to support the deployment of broadband technology. The success or failure of a broadband deployment project is primarily a function of two factors: the investment model that assesses the financial viability of the venture, and the financing model. The investment model comprises all the revenues, capital and operating expenses assumptions and provides the classical metrics of business viability, such as internal rate of return and net present value. The financing model addresses the approach that will be followed to fund the required investment to roll out infrastructure. The investment model and funding assumptions are constrained by a number of project contextual variables, comprising the competitive environment and players driving the broadband rollout.

Financing models need to be assessed not only in terms of how suitable they are in each geography and market, but also in terms of their reliance on equity, debt or public funds. The financing structure can ultimately have an impact on the project viability as well as the stress they might impose on the providers of funds. Along these lines, there is an implicit advantage of relying on public lenders such as the CAF. In the first place, they tend to have a pricing advantage over commercial lenders, derived from their credit rating and non-for-profit operating model. In addition, they tend to offer longer maturity products of 10 years and more. Indirectly, public lenders can contribute with much needed project development support, technology and industry expertise to new entrants, such as municipalities. Finally, their participation in a project provides a signaling effect to other lenders that can be convinced to extend credit due to the credibility stamp that some of these public lenders provide.

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## EXECUTIVE SUMMARY

The success or failure of a broadband deployment project is primarily a function of two factors: the investment model that assesses the financial viability of the venture, and the financing model. The investment model comprises all the revenues, capital and operating expenses assumptions and provides the classical metrics of business viability, such as internal rate of return and net present value. The financing model addresses the approach that will be followed to fund the required investment to roll out infrastructure. The investment model and funding assumptions are constrained by a number of project contextual variables, comprising the competitive environment and players driving the broadband rollout.

The required investment to deploy broadband networks – particularly fiber optic networks - emerges as the one of the central issues facing the telecommunications sector. Obviously, the importance of the funding constraint varies by technology and industry player. Due to high cost relative to demand, the investment for in-country national backbone networks and the last mile infrastructure is still confronting funding issues.

This paper reviews funding models to support the deployment of broadband technology. Mechanisms of financing of such large broadband networks can vary significantly depending on the transaction participant – for example, whether the transaction involves an incumbent carrier, an alternative operator, a financial institution (from investment banks to pension funds), a local or national government (under PPP schemes).

At the highest level, the financing model of broadband networks is composed of three sources of funds: private lenders (through a single institution or a syndicate), public funds (through grants or low interest loans), and equity investors (governments, multilaterals or the private sector). The official sector can also provide risk mitigation support.

When debt financing is utilized, it often represents 50% to 80% of total project cost. Since some development finance institutions do not usually provide credit facilities covering more than 50% of project costs, the remainder needs to be covered through equity, grants, or operating cash flow. The terms of debt financing are typically structured around a fixed interest rate, which results in fixed payments comprising principal and interest, with a maximum tenor ranging between 7 and 20 years. There are also two forms of debt financing, depending on whether the broadband project is financed as part of the project sponsor's corporate balance sheet, or off balance sheet as a separate legal project company. In the first case of corporate lending, the debt financing assumes the form of "on-balance sheet lending" where borrowed funds are reflected on the project sponsor's balance sheet. Under an "off-balance" sheet approach, the broadband project is structured as a legally independent project company financed with nonrecourse debt (and equity from one or more sponsoring firms), whereby the lender has no or limited recourse to other sponsor assets.

Beyond the general features, three general broadband financing models have been identified:

**Figure A. Types of Funding Models**

**1. Public-utility Financing Model**

- Borrowed from electric utility industry
- Funding entails a municipality, an investor (e.g. bank, pension fund) and lender
- Municipality provides certain financial and non-financial contributions (e.g. feasibility study, right of way permits, ducts access)
- Investor provides funding for equity
- Lenders require a collateral interest in assets, including rights to receive senior pledge of revenues

**2. Public-Private Financing Model**

- A PPP financing model requires investors (construction companies, banks, pension funds, infrastructure funds) and lenders (private sector project finance banks)
- Usually entails creation of a special purpose vehicle (lending is based on the projected income from the project)
- Lenders “ring-fence” revenues and hold collateral against project assets
- Project contracts are critical in mitigating against performance risks of equipment vendors
- Official sector (development banks) contribute to mitigate risk

**3. Other financing models**

- **Central government funding:** government funds through grants, low rate loans from a development banking source, or a universal service fund
- **Operator-funded:** operator funds from the capital budget, sometimes complemented by borrowing from lender at a rate reflecting the company’s WACC or e en issuing of a bond

As evidenced by the representative case studies in this study, there is no unique financing model to fund the deployment of broadband. While some of them can be more appropriate than others, it is safe to conclude at this point that the optimal model depends on the characteristics of the market in which it is applied.

Financing models need to be assessed not only in terms of how suitable they are in each geography and market, but also in terms of their reliance on equity, debt or public funds. The financing structure can ultimately have an impact on the project viability as well as the stress they might impose on the providers of funds. Along these lines, there is an implicit advantage of relying on public lenders such as the CAF. In the first place, they tend to have a pricing advantage over commercial lenders, derived from their credit rating and non-for-profit operating model. In addition, they tend to offer longer maturity products of 10 years and more. Indirectly, public lenders can contribute with much needed project development support, technology and industry expertise to new entrants, such as municipalities. Finally, their participation in a project provides a signaling effect to other lenders that can be convinced to extend credit due to the credibility stamp that some of these public lenders provide.

Finally, a number of practices that contribute to reduce the project financial risk were identified. Among those practices, the opportunity to aggregate demand to achieve critical mass, share deployment costs across players, implement an open access business model, careful development of a business plan and the conduct of a due diligence by qualified third party experts can contribute to mitigate risk. Conversely, the practices that might contribute to a project failure comprise limited support to negotiate financial debt terms, little focus on the project’s business plan, over-optimism in assessment of customer acquisition, and lack of

commitment from the project sponsor. A pooled financing model targeted to small municipalities has also been recommended as an option worth exploring.

## 1. BACKGROUND

The required investment to deploy broadband networks – particularly fiber optic networks - emerges as the one of the central issues facing the telecommunications sector. Obviously, the importance of the funding constraint varies by technology and industry player. As might be expected, access to funding for deployment of LTE<sup>1</sup> technology is relatively easy to address due to the profitability resulting from the increased demand trends of mobile broadband across the world. A similar statement could be made for the deployment of submarine cables. The increase in intercontinental traffic is such that it is difficult to argue against the profitable business case predicated on inelastic and certain strong demand resulting from international data flows.

However, due to high cost relative to demand, the issue of fixed broadband investment for in-country national backbone networks and the last mile infrastructure is still confronting funding issues. These challenges appear to be more prevalent when market structure considerations come into play. In other words, the capital intensity – particularly of ultra-fast broadband – is such that if the project sponsor is planning to operate in a highly competitive context, the strength of the business case (and consequently the set of variables relative to the funding model) is weak due to low or uncertain levels of profitability. In this context, all of the factors that make it possible to cut down on costs (e.g., good conditions for accessing passive infrastructure, infrastructure sharing rules, concentrated user population, etc.) appear to be central to shaping investment decisions and access to finance.

This paper reviews funding models to support the deployment of broadband technology. Mechanisms of financing of such large broadband networks can vary significantly depending on the transaction participant – for example whether the transaction involves an incumbent carrier, an alternative operator, a financial institution (from investment banks to pension funds), a local or national government (under PPP schemes). Along these lines, the primary objective of this paper is to analyze different funding options for the deployment of broadband and attempt to draw a taxonomy that indicates which models are more applicable for each type of network. By analyzing specific case studies, the paper identifies a number of best practices that reduce the funding risk and enhance the success of broadband projects. The case studies are drawn from the experience in broadband funding in Europe and Latin America. This cross-comparison illustrates both the similarities and differences underlying funding models between industrialized and emerging markets.

## 2. APPROACH

Broadband deployment strategies entail a variety of business models, which vary based on the type of project sponsor. There are five models, each with variants in the type of public or private sector project sponsor:

1. **National government backbone network:** Concerned about the potential "digital divide," and the capital-intensity of ultra-fast networks, national governments may invest directly in the deployment and management of a national network. This business model can follow one of three approaches, and can have either public or private sector project sponsors:

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<sup>1</sup> LTE (Long Term Evolution) is the technology standard associated with fourth generation wireless networks, generally associated with wireless broadband services.

- National open access network: The network assets of operators are purchased; the government remains a majority shareholder, at least temporarily, although the national company can be opened to private investors. The network is open to all service providers at regulated prices (e.g., NBN in Australia).
  - National open access alternative carrier: A variance of the prior model, in this case the national network remains an alternative carrier to the incumbent backbones. Its purpose is to break down potential bottleneck prices that could be raised by incumbents (e.g., Telebras in Brazil, Argentina Conectada in Argentina).
  - Government financing of the national network: In this case, the government invests temporarily in a network to be deployed by a private carrier. The purpose in this case is to facilitate through funding, the deployment of a high capacity infrastructure (e.g., NGN network in Singapore).
2. **National government local networks:** In this case the Government acts more as a facilitator by dedicating a special fund to help financing neutral open access models, most of the time being at a regional or municipality level (e.g., National Very High Speed Plan in France, Broadband Delivery UK Plan, Municipal FTTH investment in Sweden, BB Delivery in the UK). In this case, the government is the project sponsor.
  3. **Incumbent telecommunications carrier:** Forced by the competitive pressure of, most of the time, cable TV operators, or stimulated by government favorable financing conditions, telecommunications service providers, may deploy fiber in the access networks with the objective of capturing revenues derived from high capacity service, content distribution, or other sources.
  4. **Municipality:** In this case, the local government, usually a municipality, assumes ownership of a fiber optic network laid out to serve the population in its territory. The municipal model is, in many cases, triggered by the concern of the municipality to be left unserved by ultra-fast networks deployed by telecommunications carriers and cable TV operators to serve high-density areas only. In some cases, the geographic scope of the municipal model might reach more than one commune. It can assume one of three business models:
    - Municipal retail, whereby the municipality becomes the service provider offering triple play services to the population under its purview;
    - Municipal wholesale service offering (or "Open Access"), where the municipality provides access to the infrastructure to third parties (e.g. service providers) for a fee; or
    - Municipal financing of an infrastructure, which is owned, operated and maintained by a private provider on a "lease" model (based on a public private partnership model, described below).

In some countries in Latin America, the regulatory framework might prevent municipalities from entering the telecommunications market.

5. **Alternative carrier:** Under this model, the carrier (typically a cable operator but also a new entrant) deploys a broadband network in direct competition with the telecommunications incumbent (e.g., Numericable, SFR and Free in France, FastWeb in Italy, Fibertel in Argentina, and Net Servicos in Brazil).



As there is no single financing mechanism that can be applied to all business models, this paper is based on an analysis of a sample of projects reflecting a mix of local, backbone and international networks. Accordingly, for purposes of the study, broadband projects are categorized around two dimensions: by type of network and type of financing strategy.

The first dimension (**type of network**) can be defined based on three categories: local, backbone and international. The second dimension (**financing strategy**) can be categorized according to one of four possible funding models as detailed below.

- 1. Municipal financing:** Borrowed from the electric utility industry, a municipal broadband network-funding model typically entails the participation of the municipality, an investor (e.g., a development bank, or a pension fund), and a lender. The municipality (or its utility division) may provide certain financial and non-financial contributions to the project, such as funding for initial feasibility study, acquisition of required permits and rights-of-way, existing dark fiber, and accessibility to infrastructure to facilitate deployment. The investor will provide upfront funding for a start-up broadband network in exchange for equity of the project company that will operate the network. Finally, long-term debt must be secured to complete the financing package. Equity investors usually require leveraging their equity position through the use of debt, as they are unable or unwilling to finance the entire project with equity. Typically, a project borrows as much funds as possible, at the lowest interest rate possible. It is important to mention that lenders require a collateral interest in the assets of the project, which usually include the rights to receive senior pledge of revenues and receivables for debt payments before income is distributed to equity investors.
- 2. Central Government Funding:** Under this approach, the government assumes the role of funding entity through either grants, low rate loans from a development-banking source, or universal service fund allocations (e.g., Argentina, Japan, Korea, UK, and France).
- 3. Public-Private Partnership:** A PPP for the construction of a broadband network requires investors (construction companies, banks, pension funds, infrastructure funds) and lenders (private sector project finance banks), and, potentially (although more difficult) access to bond public markets. Usually PPPs use the financing technique of project finance, a specialized form of financing targeted to a "stand-alone" project (a special purpose project company), whereby lending is based on the projected income from the project, lenders ring-fence revenues, and hold collateral against the project assets. Project contracts are critical in mitigating against performance risks of equipment and other vendors ("contract-based financial engineering"). While project finance is a complex form of financing that requires extensive project development over an extended time period, it is used for many PPP projects (e.g., many municipal networks in Europe).

This approach often relies on risk mitigation mechanisms, with contributions from the official sector to reduce project development costs or risk factors affecting profitability. The private sector participant assumes primary funding responsibility but uses risk mitigation techniques aimed at improving project viability and creditworthiness (e.g., demand aggregation, reduced property taxes, grants to cover capital expenditures, etc.).

4. **Operator-Funded:** In this case, the private sector operator assumes the full ownership of the company, including all equity and sometimes a portion of debt. The broadband project sponsored by an incumbent or an alternative carrier is typically funded out of the capital budget of the company, although it can be supplemented by targeted borrowing from a lender at a negotiated rate that reflects the company's Weighted Average Cost of Capital (WACC) and an estimate of risk (i.e., beta) that accounts for project risk (e.g., approach often used in United States).

The following matrix (table 1) depicts the interrelationship between network geographic focus and funding models. This categorization was used to identify a representative sample of 22 broadband projects that were assessed to substantiate this paper's conclusions.

**Table 1: Representative Sample of Broadband Projects Analyzed (22)**

Types of Financing Strategies	Geographic Mix		
	Local		Backbone / International
	Urban/Suburban	Rural	
<b>Public-owned Funding (possibly with other investors and debt)</b>	<ul style="list-style-type: none"> <li>• Stokab (Sweden)</li> </ul>	<ul style="list-style-type: none"> <li>• Asturcom</li> <li>• Kuuskaista (Finland)</li> <li>• Reso-LIAIN (France)</li> <li>• Oberhausen an der Donau (Germany)</li> <li>• Conectividad Rural de Banda Ancha de R. Dominicana</li> </ul>	<ul style="list-style-type: none"> <li>• Argentina Conectada</li> <li>• French National Very High Speed Plan (France)</li> <li>• BB Delivery UK (G. Britain)</li> </ul>
<b>Operator-sponsored (100% equity with optional private debt)</b>	<ul style="list-style-type: none"> <li>• Empresa de Telecomunicaciones de Bogotá (Colombia)</li> <li>• KPN / Reggefiber (Netherlands)</li> <li>• Swisscom (Switzerland)</li> <li>• Lattelecom (Latvia)</li> </ul>	<ul style="list-style-type: none"> <li>• Andorra Telecom</li> </ul>	<ul style="list-style-type: none"> <li>• Seabras 1 (Brazil-USA)</li> <li>• Internexa (Brazil)</li> </ul>
<b>Public Private Partnerships (project finance approach)</b>	<ul style="list-style-type: none"> <li>• Debitex (France)</li> </ul>	<ul style="list-style-type: none"> <li>• Todo Chile Conectado</li> </ul>	<ul style="list-style-type: none"> <li>• Red Dorsal del Peru</li> <li>• Red Azteca de Colombia</li> <li>• Cable submarino a San Andrés (Colombia)</li> <li>• Autopista Mesoamericana de la Información (C. America)</li> </ul>

Source: TAS LLC

For more information on the projects, please see Appendix A that details relevant financing data.

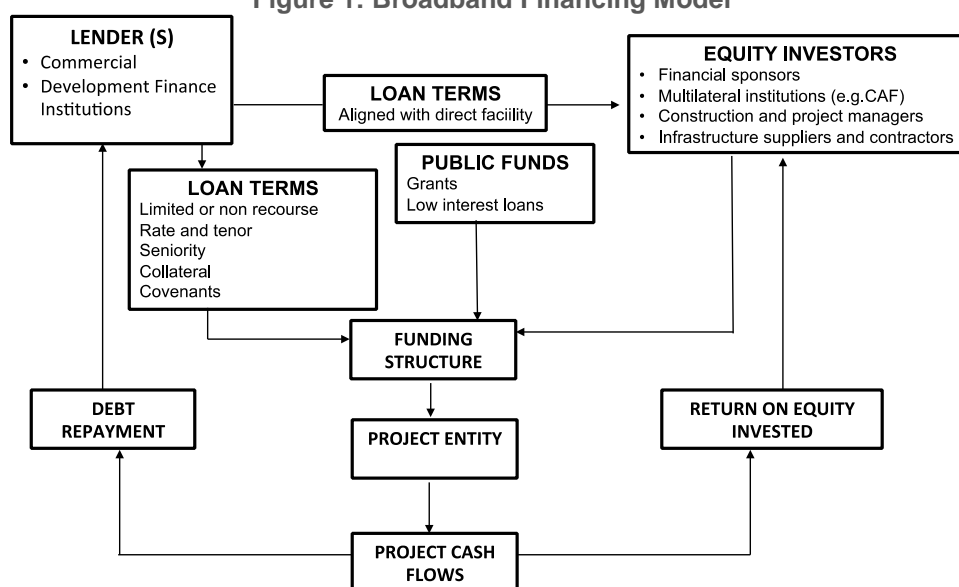
### 3. BROADBAND FINANCING MECHANISMS

Broadband financing mechanisms are wide ranging, going from 100% equity investment from governments or the private sector, to the standard example of infrastructure finance, where an investment in a capital asset generates cash flows resulting in a return to equity investors and the ability to serve the acquired debt<sup>2</sup>.

The driving force shaping the wide range of financial mechanisms is the central role of broadband in national development policy, thereby justifying high levels of public support from national and local governments, as well as development banks. For example, Finland is the first country in the world to make broadband a legal right for all its citizens, entitling them to a one megabit per second broadband connection now, with a 100-Mbit/s connection to become a right by the end of 2015. Broadband access is included in basic communication services, such as telephone or postal services. In this context, telecommunication operators cover at least 34 per cent of the costs. The rest of the costs are funded by the State (EUR 66 million for the period 2009–2015), municipalities and the European Union’s Rural Development Fund (EUR 24.6 million). It is important to note that support is given to projects that are not commercially viable.<sup>3</sup>

To illustrate this wide range of financing mechanisms, the 22 projects studied cover the full spectrum of different financing options. The assessment of the broadband financing structures of each of the projects under study requires first defining all financing components. The following generic broadband financing model captures all relevant potential components (see figure 1).

**Figure 1: Broadband Financing Model**



Source: TAS LLC

The financing model in figure 1 is composed of three sources of funds: private lenders (through a single institution or a syndicate), public funds (through grants or low interest loans), and equity investors (governments, multilaterals or private sector). As noted, the official sector can also provide risk mitigation support.

<sup>2</sup> Bruner, R. and Langohr, H. “Project Financing: an Economic Overview”, University of Virginia, 1995 differentiate between stock projects and flow projects, whereby the former are aimed to extracting and selling output to repay equity and generate returns, while the latter rely on assets to generate cash flows.

<sup>3</sup> Source: <http://www.itu.int/net/itunews/issues/2010/06/34.aspx>

When debt financing is utilized, it often represents 50% to 80% of total project cost. For example, since some development finance institutions do not usually provide credit facilities covering more than 50% of project costs, the remainder needs to be covered through equity, grants, or operating cash flow. The terms of debt financing are typically structured around a fixed interest rate, which results in fixed payments comprising principal and interest, with a maximum tenor ranging between 7 and 20 years. Interest payments can be tax deductible, depending on the country's fiscal policy.

There are also two forms of debt financing, depending on whether the broadband project is financed as part of the project sponsor's corporate balance sheet, or off balance sheet as a separate legal project company. In the first case of corporate lending, the debt financing assumes the form of "on-balance sheet lending" where borrowed funds are reflected on the project sponsor's balance sheet<sup>4</sup>. Under an "off-balance" sheet approach, the broadband project is structured as a legally independent project company financed with nonrecourse debt (and equity from one or more sponsoring firms), whereby the lender has no or limited recourse to other sponsor assets. This approach expands the universe of potential sponsors since it reduces their investment risk and provides them with more flexibility. In addition, the government can extend support in the form of grants, low interest loans, guarantees, or other risk mitigation support.

An "off-balance" sheet approach is a typical financing approach for companies owning passive broadband infrastructure that sell capacity to service companies (network operators) which, in turn, develop and sell services to end customers (service companies). In this case, lending is provided to the passive infrastructure project company, structured as a Special Purpose Vehicle (SPV), and is collateralized by the quality of the assets owned by the entity. The SPV's ability to service debt (measured by the "debt service ratio") is a key criterion for providing debt finance.

In addition to direct lending to the broadband project company, banks can provide in parallel a loan to other financing partners (such as other banks or investors), where the beneficiary is ultimately the project company. In addition, project sponsors can obtain partial credit or risk guarantees from governments and development finance institutions, reducing the risk for both providers of equity and debt. In addition, there can be project bonds, which provide liquidity for debt service payments.<sup>5</sup>

In terms of equity finance, again the spectrum of financing mechanisms is very large given the importance of broadband to national development as well as the financial strength of the telecommunication carrier. A single sponsor or group of sponsors can own the controlling stake of the broadband project entity's equity from either the private or public sectors<sup>6</sup>. In many cases, the project sponsors are usually involved in the construction and management of the project. In some cases, given the expected profitability of many projects in the sector, financial investors

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<sup>4</sup> This might not be need in the case of a financially strong company.

<sup>5</sup> For example, "Connecting Europe Facility" (CEF), part of the wider "Europe 2020" strategy, provides a longer-term financial framework ensuring that energy, transport and telecommunications projects are developed and implemented in a timely and effective manner. The subordinated debt or Project Bond Credit Enhancement (PBCE) can take the form of a loan from the Bank, with the support of the European Commission and is given to the promoter at the outset. It may also take the form of a contingent credit line, which can be drawn upon if the revenues generated by the project are not sufficient to ensure senior debt service. The PBCE underlies the senior debt and therefore improves its credit quality, offering peace of mind to institutional investors. The bonds themselves will be issued by the promoters, not by the Bank or the Member State in question. The support will be available during the lifetime of the project, including the construction phase. Source: <http://www.eib.org/products/project-bonds/>

<sup>6</sup> This could be the case of Public Private Partnerships.

can also take equity stakes in broadband projects. Financial investors providing both equity and debt capital are of five types:

1. **Governments and development partners**: Driven by policies pointing toward stimulating broadband roll-outs, public finance sources tend to execute national blanket coverage approaches, typically focused on providing funding to open access business models. In addition, home countries of equipment providers often provide support through Export Credit Agencies, and Development Finance Institutions providing support through equity injections, debt, grants, and risk mitigation support.
2. **Telecommunication companies** (network operators and service providers): They are dominant investors, ranging from 100% equity to minority shares. Additionally, technology infrastructure suppliers can extend credit for payment of the equipment.
3. **Institutional investors** (pension funds, insurance companies, etc.): They often invest in both equity and debt, through investment grade bonds or through buying shares of public companies listed on stock exchanges listed companies. However, there are some cases of direct equity investment related to broadband, such as AIG's 10% equity investment in Tata Communications, an investor in broadband.
4. **Banking institutions**: Banks are critical intermediaries as financial advisors in helping to secure debt finance from institutional and other investors, with ability to hold long-term debt. Driven by financial markets conditions and increasing regulations related to Basel III requiring increased capital allocations, they are extremely risk averse with regard to long-term debt loan. Therefore debt finance is usually restricted to funding the replacement of existing networks, rather than taking the risk of start-up broadband businesses. In addition, their participation is done through funded risk-sharing facilities, such as syndications to other banks, institutional investors, and other investors.
5. **Venture capitalists and angel investors**: These investors are willing to take more risk, providing equity funding for a business at the start-up or early phase roll-out with the purpose of capturing a significant high upside. Angel capital investors are focused on providing seed financing and ensuring the proper feasibility and technical studies and related financial analysis to ensure viability and profitability. Their equity positions are typically taken at the front-end of a process of greenfield deployment (i.e., in the asset intensive phase). Venture capitalists are often constrained by a shorter-term investment horizon than angel investors; their willingness to invest is driven by a compelling investment thesis, generally focused on growing vertically integrated closed broadband business models. Two types of venture capitalists exist: seed/early stage funds and formal venture capital funds.

As mentioned in the section on financing strategies, the type of project sponsor has a direct bearing on the selected financing strategy. If a large incumbent, defined as a dominant carrier with significant market share, handles the broadband rollout, the financing model obviously differs in terms that no sponsors beyond the incumbent would be asked to share in the equity. Furthermore, funding for the rollout could be handled through capital sourced from either the incumbent's cash flow or borrowed funds through bank loans and/or guarantees. A bank

typically finances up to 50% of the eligible project costs, although the amount of the loan resides on the balance sheet of the corporation sponsoring the project (per the “on-balance sheet” approach described above), given the strong balance sheet of the large incumbent as a whole, and its ability to service the project debt. In this case, borrowing costs would benefit from the weighted average cost of capital (WACC) of the incumbent. In general, the WACC of an established incumbent is lower than that of a new entrant due to its lower risk profile, for there is a common preference for on-balance sheet corporate loans. On the other hand, smaller carriers are more open in their financing strategies, accepting other equity investors.

When roll-out responsibility is not assumed by the incumbent, the broadband financing model often entails the creation of a legally independent project company, funded with none or limited recourse debt and equity provided by one or more project sponsors. Debt servicing and the return on equity invested are typically funded out of the project cash flow, which means the security of project debt and reliability of equity upside depends on the project profitability.

Having examined the structure of generic financial models, we will now turn to deeper analysis of these specific project types on the basis of reviewing some of the projects under study.

#### 4. BROADBAND FUNDING CASE STUDIES

As noted above, three general broadband financing models have been identified:

**Figure 2. Types of Funding Models**

##### 1. Public-utility Financing Model

- Borrowed from electric utility industry
- Funding entails a municipality, an investor (e.g. bank, pension fund) and lender
- Municipality provides certain financial and non-financial contributions (e.g. feasibility study, right of way permits, ducts access)
- Investor provides funding for equity
- Lenders require a collateral interest in assets, including rights to receive senior pledge of revenues

##### 2. Public-Private Financing Model

- A PPP financing model requires investors (construction companies, banks, pension funds, infrastructure funds) and lenders (private sector project finance banks)
- Usually entails creation of a special purpose vehicle (lending is based on the projected income from the project)
- Lenders “ring-fence” revenues and hold collateral against project assets
- Project contracts are critical in mitigating against performance risks of equipment vendors
- Official sector (development banks) contribute to mitigate risk

##### 3. Other financing models

- **Central government funding:** government funds through grants, low rate loans from a development banking source, or a universal service fund
- **Operator-funded:** operator funds from the capital budget, sometimes complemented by borrowing from lender at a rate reflecting the company’s WACC or e en issuing of a bond

Based on these three types, the following case studies were selected for study.

**Table 2. Broadband Financing Models**

Model	Europe Cases	Latin American cases
<b>Public-owned utilities</b>	<ul style="list-style-type: none"> <li>• Asturcom (Spain)</li> <li>• Oberhausen an der Donau (Germany)</li> <li>• Kuuskaista (Finland)</li> <li>• Reso-LIAIN (France)</li> </ul>	<ul style="list-style-type: none"> <li>• Argentina Conectada</li> </ul>
<b>Operator-sponsored</b>	<ul style="list-style-type: none"> <li>• KPN / Reggefiber (Netherland)</li> </ul>	<ul style="list-style-type: none"> <li>• Seabras 1 (US-Brazil)</li> <li>• ETB (Colombia)</li> </ul>
<b>Public-private funding</b>	<ul style="list-style-type: none"> <li>• Debitex (France)</li> </ul>	<ul style="list-style-type: none"> <li>• Red Dorsal del Peru (Peru)</li> <li>• Red Azteca (Colombia)</li> <li>• Mesoamericana Information Highway (Central America)</li> <li>• Cable Submarino San Andres (Colombia)</li> </ul>

The following case studies analyzed the different options identified under each model and isolate some of its common features.

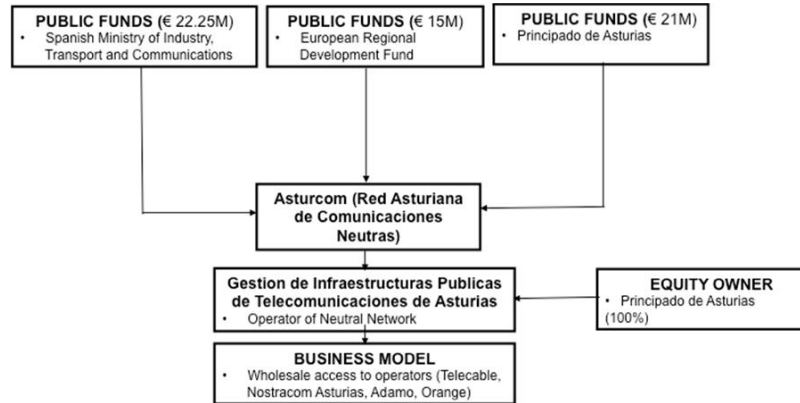
**4.1. Public-owned utility financing models: Large variances in debt and equity financing**

The five case studies of publicly owned broadband projects – Asturcom (Spain), Oberhausen an der Donau (Germany), Kuuskaista (Finland), Reso-LIAIN (France), and Argentina Conectada -- vary significantly in terms of sources of finance, both equity and finance.

Asturcom, the open access FTTH network deployed in the Principado de Asturias, has been entirely financed by public funds supplied by the Spanish government, the European Regional Development Fund<sup>7</sup> and the local government. In addition, the local government is whole owner of the network operator (see figure 3).

**Figure 3: Example of 100% Public Funding (no debt): Asturcom Financing Model (Spain)**

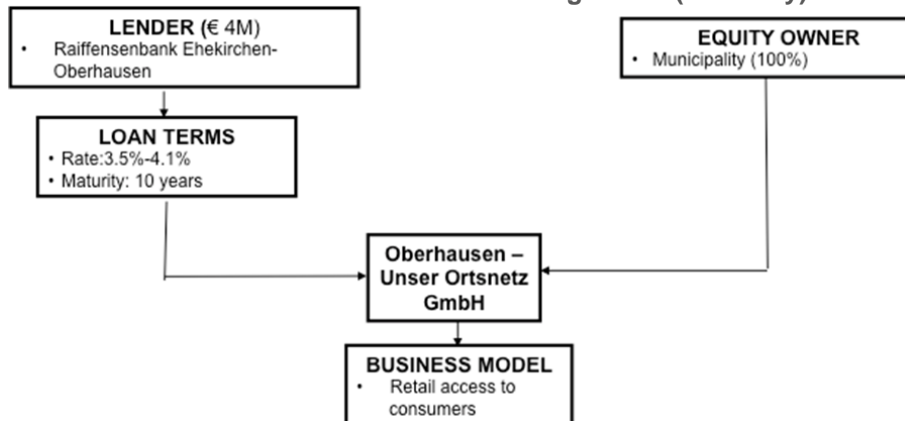
<sup>7</sup> The European Regional Development Fund (ERDF) is aimed at economic regeneration projects promoted primarily by the public sector. ERDF helps projects, which offer substantial benefits that meet the needs of the region and its local areas that would not take place without a grant. The rest of other funding, known as “match funding”, and comes from other sources such as local governments, central government, other public entities, or the private sector.



Source: TAS LLC

In the second model, the Oberhausen an der Donau municipality in Germany has taken a loan for 100% of its investment needs from a local commercial bank. The terms were similar to those provided by the European Investment Bank for other broadband projects (see figure 4).

**Figure 4: Example of 100% Public Equity with 100% Bank Debt: Oberhausen an der Donau Financing Model (Germany)**

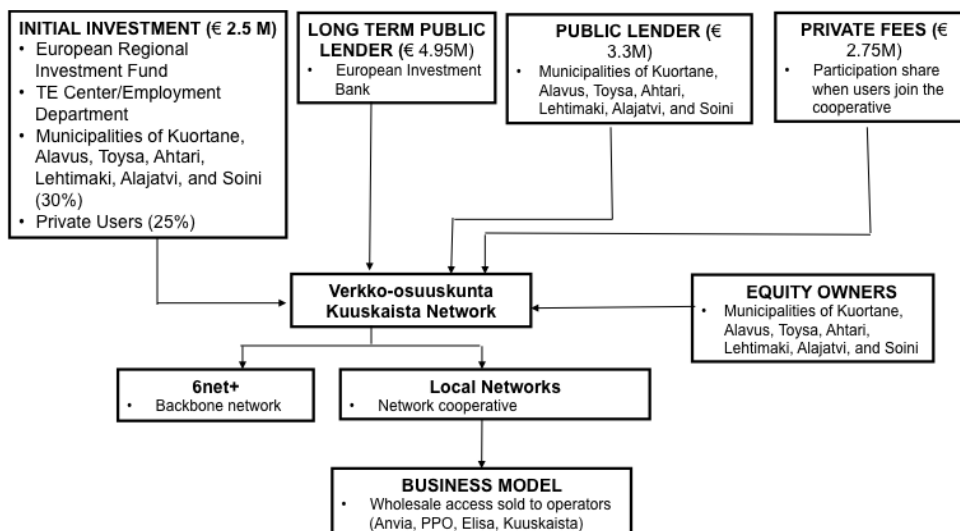


Source: TAS LLC

The third case study of public-owned utility financing, Verkko-osuuskunta Kuuskaista Network (Finland), is a hybrid of the two prior models, albeit with some peculiar characteristics. Similarly to Asturcom, this fiber cooperative structured for seven towns in Finland has benefitted from investment funds provided by the European Regional Investment Fund. In addition, as in the case of Asturcom, the local government (in this case, the municipality) also invested upfront. To complement the initial seed funding, the operator borrowed funds at similar terms as in the case of Oberhausen an der Donau. However, rather than relying on a commercial bank as the debt provider, the municipal project sponsors secured a facility from the European Investment Bank. Finally, this facility was complemented with additional loans from the municipalities that have 100% equity ownership, another source of funding that did not exist in the prior cases. The financing model is depicted in figure 5.

**Figure 5: Detailed Funding For Verkko-osuuskunta Kuuskaista Project (Finland)**





Source: TAS LLC

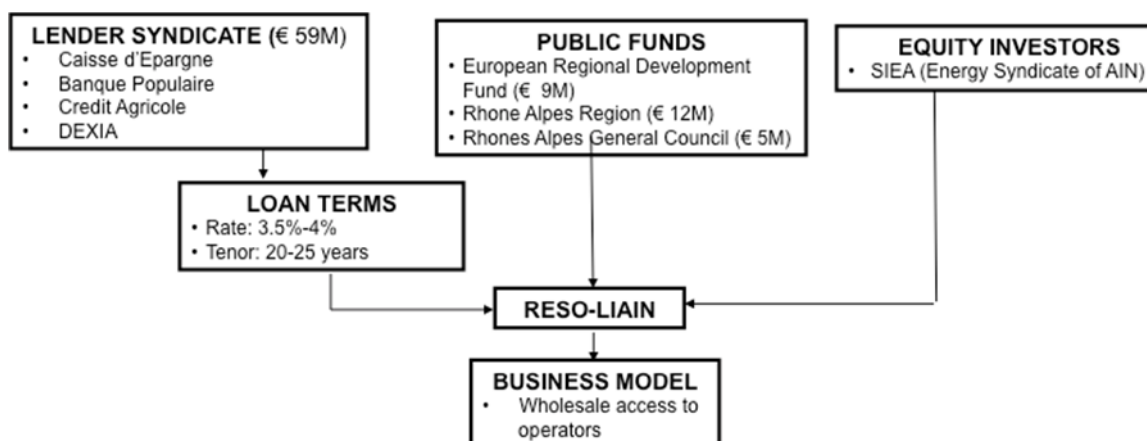
As shown in figure 5 (see private fees), part of the investment for this Finnish project was supported by connection fees, a cooperative cost sharing structure aimed at lowering the company's CAPEX. This approach is an example of a collaborative funding scheme that breaks down the deployment costs, and assigns funding responsibilities by stakeholder. To share deployment funding by stakeholder, the overall costs were broken down in three parts:

- Utility access to the building (i.e., the line connecting the road access to the building itself, including residential homes, commercial buildings, factories, etc.)
- Building wiring (i.e., “risers” that extend the utility access to individual access points in the building)
- In-premise cabling (i.e., the wiring required inside the individual premise to the users of the service)

The first portion, utility access to the building, was funded through the technology vendor, which extended credit against the purchasing and installation of equipment (fiber and electronics), complemented by funding from the principal sponsor for construction. The second portion (building wiring) was funded by the building developer, which benefited from enhancing the value of the real estate by offering high-speed services. The third portion of the network (in-premise cabling) was funded by the user (e.g., house owner or tenant, office tenants, etc.), in a pay-as-you-deploy modality.

Another financing model also used public funds and bank debt, but it is owned by a public body instead of a private sector carrier. Reso-LIAIN, a wholesale fiber optic project sponsored by the public body Energy Syndicate of Ain (SIEA), focused on deploying a wholesale access network in the French department of AIN. It received in its first phase of deployment € 26 million in public financing from the European Regional Development Fund, the Rhones Alpes Region and the Regional Government Council. The remaining funds of this phase (€ 59 million) were acquired through a credit facility negotiated with a banking syndicate, following standard infrastructure lending terms (see figure 6).

**Figure 2: 100% Public Ownership with Public Funds and Bank Debt: Reso-LIAIN Group B.V. Financing Model (France)**



Source: TAS LLC

In another example of public-utility financing, the national backbone *Argentina Conectada*, is a wholly-owned network by ARSAT, a public company in Argentina. The national network is entirely funded by the government, according to the following budget:

- 2012-13: \$ 507 million
- 2014-15: \$ 493 million

The networks within each province were funded through a “fideicomiso” with the Banco de Inversion y Comercio Exterior.

The table 3 below presents a comparative summary of the financing models of the five public-owned broadband projects under study.

**Table 3: Comparative Financing Analysis of Public-Owned Broadband Projects**

Funding Type	Funding Sources	Asturcom (Spain)	Oberhausen an der Donau (Germany)	Kuuskaista (Finland)	Reso-LIAIN (France)	Argentina Conectada
Initial Investment Funding	Public Funding	Yes	No	Yes	Yes	Yes
	Central Government	Yes	No	Yes	No	Yes
	Local Government	Yes	No	Yes	Yes	Yes
	Private Sector (Carriers, other)	No	No	Yes	No	No
Long Term Lending	Public Funding	No	No	Yes	No	No
	Local Government	No	No	Yes	No	No
	Commercial Banks	No	Yes	No	Yes	No
Funding from coop fees		No	No	Yes	No	No
Connection Fees		No	No	Yes	No	No

Source: TAS LLC

As the table above shows, the public sector (including regional, national, and local levels) has played a major financing role for the public broadband projects with providing both initial funding and access to long-term debt.

Another issue that needs to be analyzed for public broadband projects is the locus of risk for project sponsors. In general terms, as public sector broadband projects can have either public or private sector project sponsors, they can be placed along a spectrum of responsibility and risk, ranging from the private to the public sector in terms of the primary direct assumption of project risks. For example, a “Build, Own and Operate” (BOO) model, where the private sector assumes primary responsibility in return for annual payment places the majority of risk on the private sector. A project in which the private sector contracts with the private sector to build the network and transfer the asset to the public sector for operation places the primary risk on the public sector after project completion.

Table 4 below summarizes the key risk features regarding the five public projects under study.

**Table 4: Primary Funding Responsibility in Public Broadband Projects**

	Public Sector Sponsors	Private Sector Participants
Asturcom (Spain)	Government-owned network operator (GPT)	
Oberhausen an der Donau (Germany)	Municipality owns the network; assumes responsibility for debt repayment to commercial banks	Sacoin Gmhb assumed construction
Kuuskaista (Finland)	Verkko-osuuskunta Kuuskaista Network	
Reso-LIAIN (France)	SIEA	
Argentina Conectada	ARSAT	

Source: TAS LLC

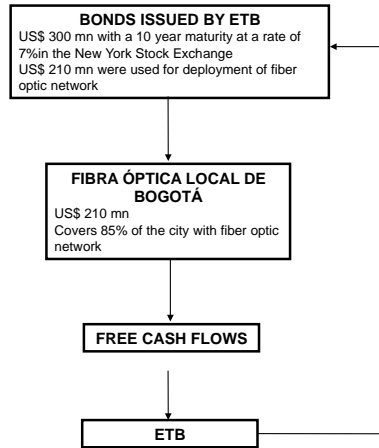
In four of the five projects, the local government or a related public body assumed the primary risk of the project as project sponsor, taking the risk of equity investment and debt service. It was found that public sector project sponsors were provided low interest rate on credit facilities from both public sector entities and commercial banks, reflecting creditor perception that local governments have long-term risks.

#### 4.2. Operator-sponsored Financing Models: Diverse debt models

As noted earlier, under the operator-sponsored model, the service provider tends toward financing structures that ensure its control of the project. Therefore, operator-sponsored projects are financed with funds that do not involve other equity investors.

Debt structures are varied. Most incumbent-sponsored broadband projects are funded out of company CAPEX, complemented with debt finance. In some cases, all funding is debt, with a bond offered in the capital market to fund the whole investment. For example, the Empresa de Telecomunicaciones de Bogotá (ETB), the local company serving Colombia’s market, issued a ten-year US\$ 300 million bond in the United States at a rate of 7%. Of this US\$ 300 million bond, 70% (US\$ 210 million) was used to fund the deployment of a local FTTH network serving 85% of Bogota (see figure 7).

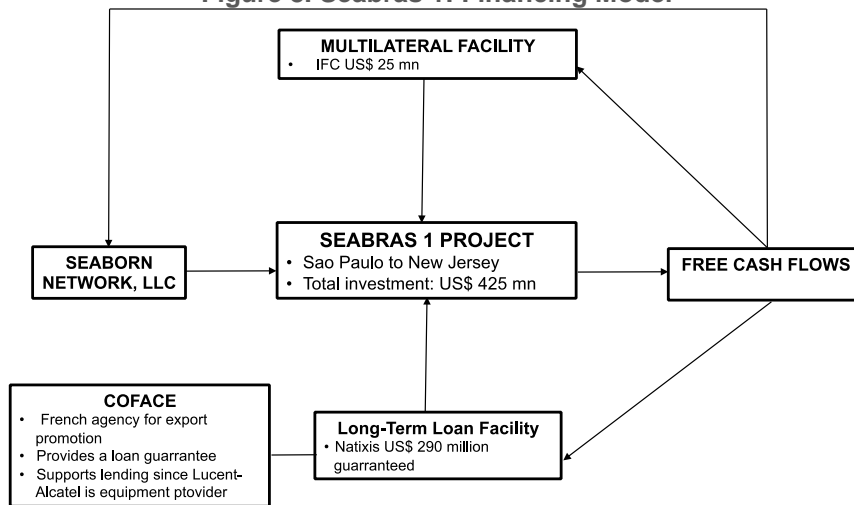
**Figure 7. Empresa de Telecomunicaciones de Bogota (ETB) Fiber Optic Bond**



Source: TAS LLC

A more complex debt-funding model is also used, leveraging support from export credit agencies and development financial institutions. For example, a different funding strategy was executed by the private company Seaborn Network, investing in broadband project of US\$ 425 million to deploy a submarine cable between Sao Paulo and New Jersey (see figure 8 below).

**Figure 8. Seabras 1: Financing Model**



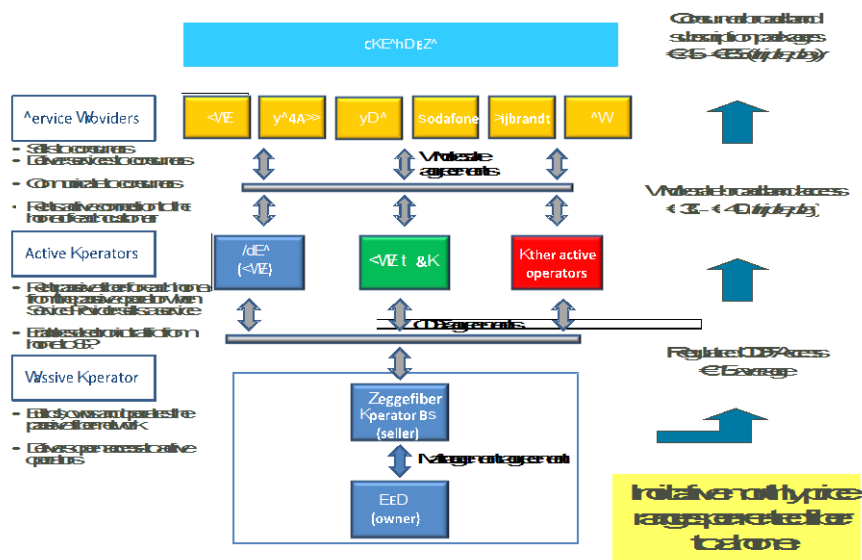
Source: TAS LLC

The total project was funded with a combination of equity from the project sponsor and two loans, one from a development finance institution (IFC) and the second one from a private French bank. The US\$ 290 million senior secured debt was underwritten by Natixis, which was also the sole bank. The French loan was guaranteed by the *Compagnie Française d'Assurance pour le Commerce Extérieur* (COFACE), the French export credit agency, since the equipment provider was a French company.

A blended finance model, including support from both development finance institutions and commercial banks, is illustrated by the Reggefiber project in the Netherlands. Reggefiber is a joint venture between KPN, the incumbent Dutch telecommunications operator, and Reggeborgh, a private investment firm active in building and construction (VolkerWessels), energy (EVI, Frisol van der Sluis), and real estate. The cooperation between joint venture

partners is mutually exclusive with regard to the construction and operation of passive FTTH networks. The passive networks are open to all active operators and their service providers (see figure 9).

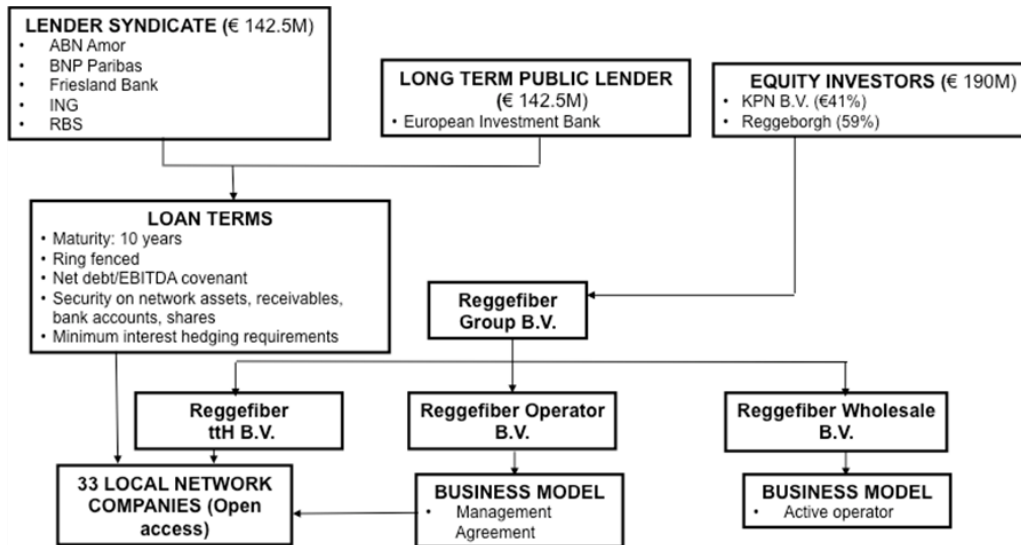
**Figure 9. Reggefiber Business Model**



Source: Reggefiber

At project inception, KPN was the minority shareholder (41%) in the joint venture, but it had a call option to increase its participation to 51% in 2012 and 60% in 2013. In 2012 KPN increased its share to 60% with another call/put option for an additional 10%. Figure 10 below details the overall financing structure of the project.

**Figure 10: Blended finance from Development Finance Institutions and Commercial Banks: The Reggefiber Group B.V. Financing Model**



Source: TAS LLC

The Reggefiber project had an equity investment of € 190 million, made by the two owners, complemented by € 285 million in secured credit facilities from the public and private sectors. At its origin, the debt to equity ratio was planned to be 75/25 but given the financial crisis the banks required a higher percent of equity (40%). Equity contribution was made at a pro-rata share of capital structure.

The debt was split 50/50 between a lending syndicate (of five private commercial banks) and the European Investment Bank. The loan terms were guided by standard market terms for infrastructure projects (10 year maturity, minimum interest hedging requirement, etc.). Most importantly, the project revenues are ring-fenced to ensure debt service payments, around the 33 local passive network companies owned by Reggefiber, and are collateralized by each of the companies' network assets, receivables, bank accounts and shares.

This structured financing model has several attractive features reducing risk for both the project sponsors and the lenders. First, risk is reduced due to joint ownership including the incumbent telecommunications carrier, thereby ensuring stability, economies of scale and lower costs. Second, as the incumbent, Reggefiber benefits from long-term regulatory certainty since its operations are guided by well-defined wholesale access rules. Third, by ring-fencing the credit facilities lending on a nonrecourse basis (i.e.: no recourse to other company assets), equity investors benefit from a lower investment risk. Fourth, the draw test on the credit facility is driven by the number of acquired customers. This procedure establishes a market-driven threshold. Finally, funds to be drawn from credit facility are subject to specific due diligence before receiving approval, which reduces overall lending risk.

This model is particularly attractive to Latin America. First, it has the potential to generate revenues for local governments. It also provides an opportunity to build infrastructure-sharing mechanisms (highways, metros, etc.). Further, it entails a possibility of accelerating fiber optic deployment in key urban settings.

Given the critical need for large amounts of capital and their critical role in national economic development projects, backbone and other large broadband projects such as FTTH deployment

are expected to increase the use of the collaborative public-private blended financing model exemplified by KPN/Reggefiber. In fact, several other incumbents have entered into similar collaborative agreements. For example, France Telecom has started to partner with its competitor, SFR, to deploy FTTH/H networks in second tier cities and rural areas of France. Similarly, Deutsche Telekom has launched a pilot project with EWE Tel, an alternative network operator in Northern Germany to roll out FTTH in regions of the federal state of Lower Saxony. The roll out is conducted independently by each partner with the agreement that each of them will grant bit-stream access to the other.

In another project in Switzerland, the incumbent operator, Swisscom, has deployed a cooperative arrangement with several power utilities, in order to lower the CAPEX requirement. A precondition for the cooperation is that a multi-fiber and Point-to-Point Architecture will be implemented, so that fiber swap and a long-term fiber – right of use can be used by the partners. Swisscom’s market share amounts to 60%. As a result, whenever Swisscom and a utility invest together in fiber deployment, Swisscom has to contribute financing 60% of the total investment.

In addition to structuring the multi-fiber arrangement, Swisscom, the incumbent carrier, has partnered up with the municipality of Basel to deploy FTTH. The total investment is shared 60/40, with Swisscom investing SFR 175 million and the municipally owned electric utility (WB) contributing SFR 70 million. The investment of the electric utility is funded partly with its own capital, complemented with a 30-year loan of SFR 22 million from the municipal government.

#### **4.3. Public - private partnership financing models**

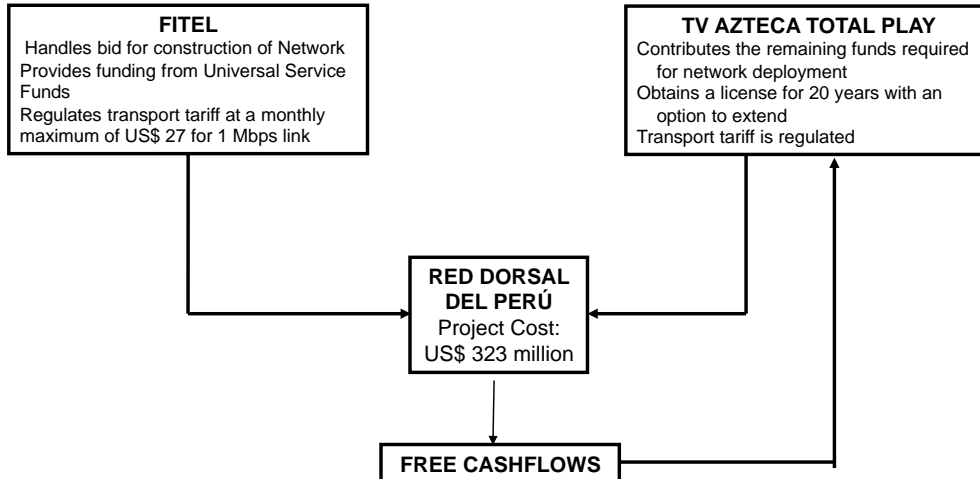
Public-private partnerships are fairly common in the funding of national backbone networks. These are very large projects, often costing over US\$ 500 million, so securing the required financing is a challenge.

There are five representative case studies used in this paper to illustrate financing models for public-private partnerships: Peru’s Red Dorsal project, Colombia’s Red Azteca project, Debitex (France), the Mesoamerican Information Highway (Central America), and the Cable San Andres submarine cable project (between Panama, Colombia and Latin American countries).

Contrary to the Argentine case reviewed above, where the national backbone was funded in its entirety by the government budget, Peru’s Red Dorsal and Colombia’s Red Azteca represented a shared financing approach involving both the government and the private sector. In the Peruvian broadband backbone project, the Peruvian Universal Service Fund, funded by prior national telecommunication-related taxes, is providing an investment of US\$ 760 million<sup>8</sup>. The Mexican carrier investor - Red Azteca – is investing the remainder of the total investment (see figure 11).

**Figure 11. Latin Carrier and Universal Service Funding:  
Dorsal del Peru Financing Model**

<sup>8</sup> It is important to note that National Universal Service Funds, as national taxation schemes for telecommunication usage, represent a critical potential source of funding for expanding broadband access.

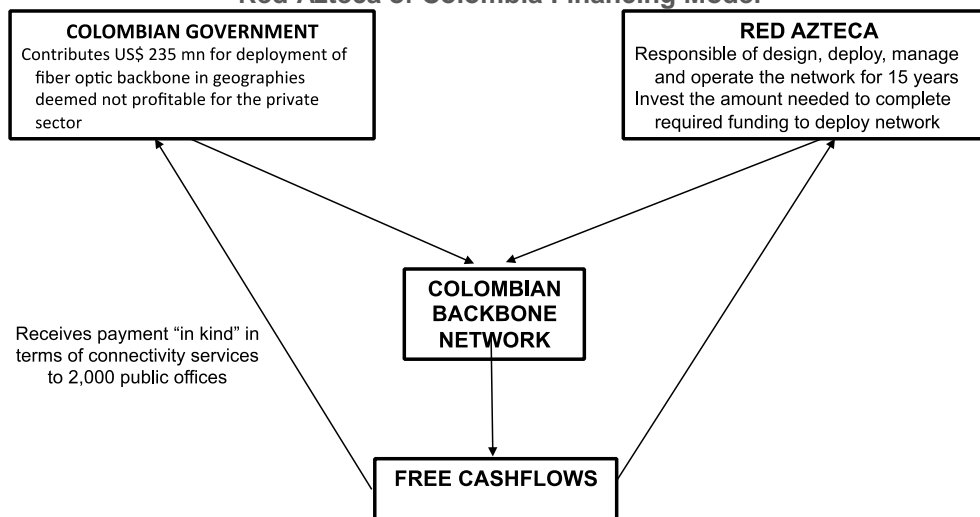


Source: TAS LLC

The Government of Peru maintains the ownership of the network, but provides a concession for operations for twenty years. A portion of network capacity will be used for health, education and defence applications. The Peruvian government subsidizes the operator while the project is operating at a loss. Once the project becomes cash positive, the profits are shared with the government.

A slightly modified model was implemented for the Azteca network in Colombia. In this case, the licensing period lasts 15 years, while the government receives a return for its US\$ 235 million investment by having the network provide free connectivity services to 2,000 public offices. The private investment is estimated at approximately US\$ 439 million (see figure 12 below).

**Figure 12. Combined Public and Private Sector Financing:  
Red Azteca of Colombia Financing Model**



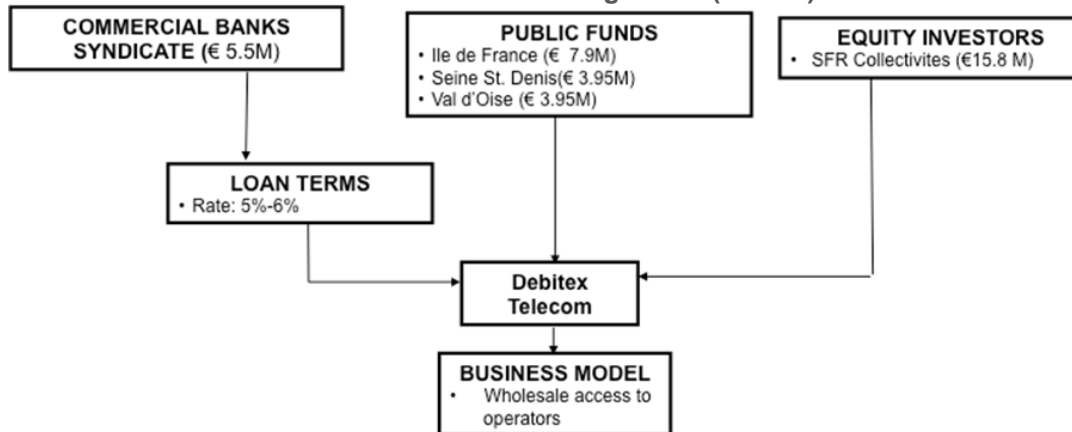
Source: TAS LLC

A slightly different model was followed by the Debitex project, a concession of public service (délégation de service publique) for a fiber network covering the French regions of Val d'Oise and Seine Saint Denis. In this case, the private sector carrier SFR Collectivités, is the project sponsor, contributing the total equity investment of €15.8 million. As in the model above, the



remaining funds were acquired through public sources from the departmental governments of Ile de France, Seine St. Denis and Val d'Oise (€ 15.8 million) and a commercial bank syndicate with slightly higher interest rate (€ 5.5 million at 5%-6%) (See figure 13).

**Figure 13: 100% Carrier owned with Public Funds and Bank Debt:  
Debitex Telecom Financing Model (France)**

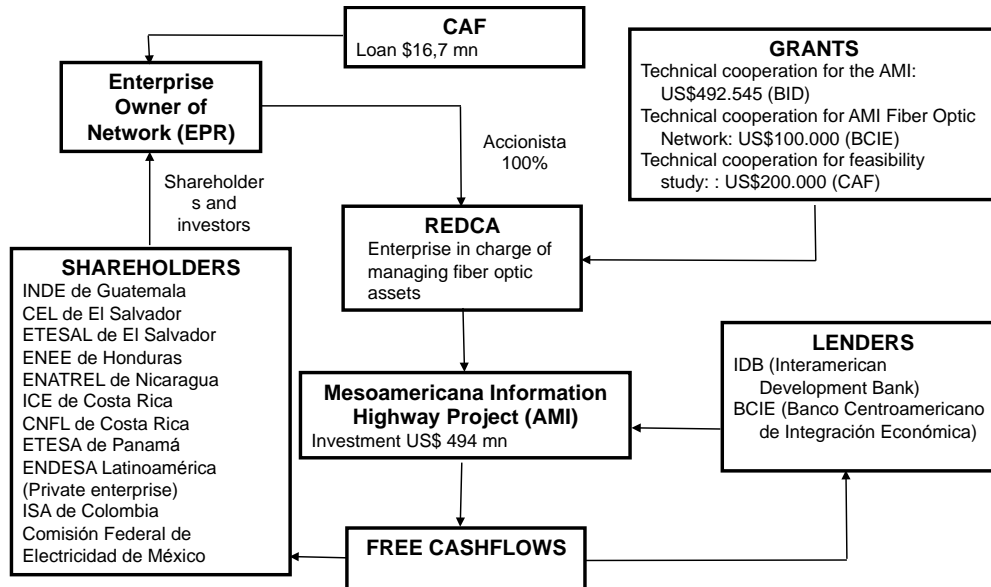


Source: TAS LLC

Another funding model is that of Cable San Andres in Colombia. The sponsor of the project, deploying a submarine cable between Panama, Colombia and Latin American countries, is a Colombian private company, which won a bid launched by the Colombian government. Of the US\$ 63 million of project cost (between Colombia and Panama), the IFC provided US\$ 10 million, the Colombian government contributed an undisclosed sum, and the remainder was contributed by the private project sponsor. The project includes loans provided by local Colombian banks.

In another type of PPP project relying on support from development finance institutions, the telecommunications company, a joint venture of public and private companies, creates a special purpose vehicle (the project company) that receives funding from one or more development finance institutions. The revenues collected by the special purpose vehicle are ring-fenced for prioritizing debt servicing. The Mesoamerican Information Highway illustrates this type of PPP project with funding from three development finance institutions covering the costs of project development as well as long-term loans (see figure 14 below).

**Figure 14. Project with Extensive Support from Three Development Finance Institutions:  
Mesoamerican Information Highway Financing Model**



Source: TAS LLC

The network, which is in essence, the interconnection of Central American telecommunications networks, received initially a number of non-refundable technical assistance grants for feasibility study purposes. The funds were channeled through REDCA, the enterprise in charge of deploying and operating the network. Beyond this, the deployment funds were extended through lending facilities from three multilateral institutions: IDB and BCIE (to the special purpose vehicle), and CAF (to the joint venture owner of REDCA).

## 5. MOST APPROPRIATE FINANCING MODELS BY TYPE OF BROADBAND PROJECT

In this section, we summarize the most appropriate financing models based on the preceding analysis. In order to identify the most appropriate funding mechanisms by type of broadband network, we use the original sampling framework and categories defined at the beginning of the paper (see table 5 below).

**Table 5: Representative Sample of Broadband Projects Analyzed**

Model	Europe Cases	Latin American cases
Public-owned utilities	<ul style="list-style-type: none"> <li>Asturcom (Spain)</li> <li>Oberhausen an der Donau (Germany)</li> <li>Kuuskaista (Finland)</li> <li>Reso-LIAIN (France)</li> </ul>	<ul style="list-style-type: none"> <li>Argentina Conectada</li> </ul>
Operator-sponsored	<ul style="list-style-type: none"> <li>KPN / Reggefiber (Netherland)</li> </ul>	<ul style="list-style-type: none"> <li>Seabras 1 (US-Brazil)</li> <li>ETB (Colombia)</li> </ul>

- Public-private funding
- Debitex (France)
  - Red Dorsal del Peru (Peru)
  - Red Azteca (Colombia)
  - Mesoamericana Information Highway (Central America)
  - Cable Submarino San Andres (Colombia)

Source: TAS LLC

### 5.1. Public-owned broadband projects

Based on the analysis of the projects, the most prevalent model varies by geography where the project is being deployed. For example, in urban and suburban broadband projects the municipality acts as an investor, similar to that of a private company. In some cases, given the larger number of potential subscribers, the municipality can potentially benefit from co-investment from private parties for deployment of passive infrastructure. Such is the case of Stockholm’s Stokab project. Amsterdam’s Citynet is a slightly different model insofar that the municipality benefitted from co-investment from the private sector<sup>9</sup>. The advantage of controlling the market through an open access model in an urban market can be leveraged to obtain attractive financing terms. Furthermore, the business model is such that the project can become self-sufficient very rapidly and fund investment from cash flow.

As shown in the prior analysis, there is a large spectrum of different financing mechanisms for rural broadband projects given the large challenge of lower numbers of users. At one end of the spectrum, there is the direct subsidy model, such as Asturcom (Spain), where public funds supplied by the government finance the project in its entirety. In the second model, the local government invests as would a private company in a business venture and borrows funds from a public source. This is the case of the Verkko-osuuskunta Kuuskaista project in Finland. In the third case, the municipality borrows funds from the private credit markets in order to finance the project. Such is the case of Oberhausen an der Donau (Germany). The fourth model is a hybrid of the second and third models, since the municipality or confederation of municipalities borrows funds from both public and private sources. Such is the case of Reso-LIAIN (France).

Each of these four financing models exhibits advantages and disadvantages (see table 6 below). If public funds are used, there is the vulnerability of non-sustainability of access if user fees do not cover costs and the public sector can no longer subsidize the use of broadband. If blended finance is used (both public and private sector funding), there will be the requirement for cost recovery built into the project structure, as private sector lenders will need to ensure their credit requirement for a sustainable project are fully met.

**Table 6: Advantages and Disadvantages of Public-owned Financing Models**

Model	Description	Advantages	Disadvantages	Examples Discussed
1. Direct Subsidy	Public funds pay for broadband project based on an open access	<ul style="list-style-type: none"> <li>• Local government retains ownership of infrastructure</li> <li>• Local</li> </ul>	<ul style="list-style-type: none"> <li>• Ongoing financing required as users do not pay cost of service</li> <li>• Continued reliance on state aid</li> <li>• Public sector assumes market risk</li> <li>• Competitive encroachment could</li> </ul>	<ul style="list-style-type: none"> <li>• Asturcom (Spain)</li> <li>• Argentina Conectada (Argentina)</li> </ul>

<sup>9</sup> In addition, it is important to note that the starting point of both projects differed: the Stokab starting business concept was a metro ring in Stockholm, while Citynet’s starting model was FTTH.

	business model	government can ensure own needs are covered	erode project viability	
2. Local public sector Investment	Local government invests as would a private player in a private venture deploying the infrastructure	<ul style="list-style-type: none"> <li>• No state aid</li> <li>• Local government bears the failure risk alone</li> <li>• More lenient credit terms (rates, maturity) based on municipal profile</li> </ul>	<ul style="list-style-type: none"> <li>• Need to rely on public funds to invest</li> <li>• Risk of impacting local taxes</li> <li>• Potential competitive retaliation</li> <li>• Highly dependent on income of population</li> </ul>	
3. All debt financing from private sector	<ul style="list-style-type: none"> <li>• Same as above, but funds borrowed from private sources</li> <li>• Service revenues are earmarked to service debt</li> </ul>	Private sector lender takes full risk of repayment, so no repayment risk to public sector	<ul style="list-style-type: none"> <li>• Lenders will require users pay full cost of service to ensure ability to repay debt</li> <li>• Loan terms will be at market rates and reflect perceived risk level of project, so potentially higher cost of finance than from public sources</li> <li>• Forces a period of full service ran by local government</li> <li>• Risk of bankruptcy with asserts taken over by lenders</li> </ul>	<ul style="list-style-type: none"> <li>• Oberhausen an der Donau (Germany)</li> <li>• Debitex (France)</li> </ul>
4. Blended Debt Finance (using both public and private financing)	Similar as above, but loans borrowed from both public and private sources	<ul style="list-style-type: none"> <li>• Involvement of public and private lenders ensures project structure is stable to ensure long-term sustainability</li> <li>• Public sector lending and/or guarantees will reduce risk perceptions and therefore cost of private debt</li> </ul>	<ul style="list-style-type: none"> <li>• Borrowing from private sources could be limited or expensive if projected profitability is not sufficient</li> </ul>	<ul style="list-style-type: none"> <li>• Reso-LIAN (France)</li> <li>• Verkko-osuuskunta Kuuskaista (Finland) only public financing</li> </ul>

Based on advantages and disadvantages of these alternatives, it would seem that the blended finance model with both public and private lenders could be the most attractive in terms of long-term sustainability. The involvement of a public lender such as the CAF can provide risk reduction for private lenders, by sharing credit risk.

In addition, the reliance on fees from subscribers for supporting connection charges (see Verkko-osuuskunta Kuuskaista) could reduce some of the project's project costs. This approach could be used in all the above financing models.

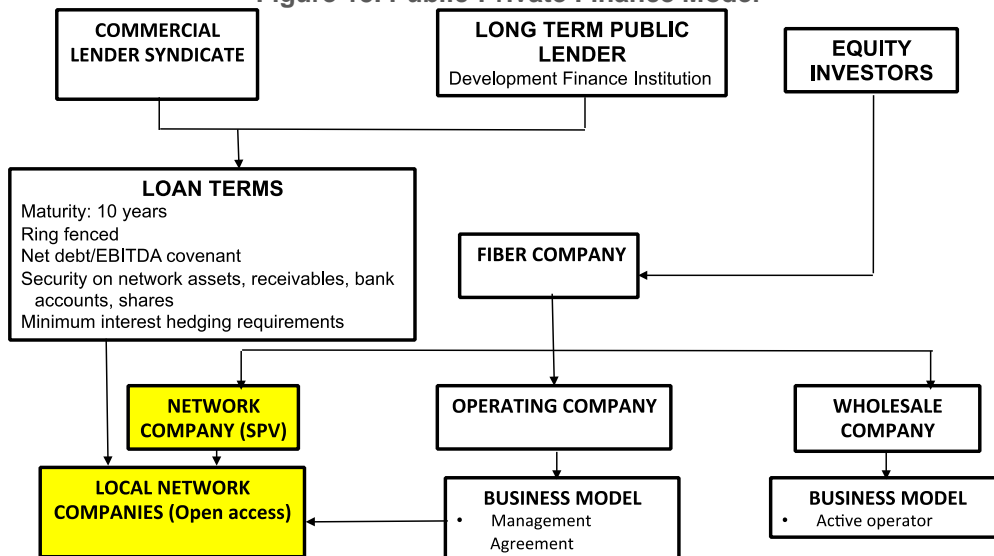
## 5.2. Public - private partnerships

The public/private partnership model is in effect a variation of the last municipal model presented above, but entailing a private sector entity that assumes operational responsibility for the project. A Public-Private Partnership for the construction of a broadband network can involve a wide spectrum of the private sector: investors (incumbents, construction companies, banks, pension funds, infrastructure funds); lenders (private sector banks); and potentially private sector financial intermediaries to access bond markets.

As noted in the prior section, public-private partnerships encompass a wide variance in financing sources, including the government, development finance institutions, universal service funds, institutional investors, and incumbents, and other private sector companies. At its most basic level, the public entity role may be limited to project sponsor, enabling the private participants to gain access to tax-exempt financing. Alternatively, the public entity may be guaranteeing the private project sponsor's debt.

The most common financing model for public-private partnerships is project finance, a specialized form of financing targeted to a "stand-alone" project (a special purpose project company), whereby lending is based on project-specific cash flow, and lenders rely on ring-fenced cash flows to ensure debt service with collateral in the project company (see figure 15).

**Figure 15. Public-Private Finance Model**



While project finance is a complex and an expensive form of financing, it is used for most major Public Private Partnership projects as the very structured approach enable access to the significant private sector funding required for major broadband projects. The more traditional PPP model involves the use of some level of public resources or financing capabilities to implement a broadband project. Under this arrangement, the public entity provides some combination of tax incentives, public land or other assets, infrastructure investment or financing methods. On the other hand, the private sector participants make capital investments, commit to

provide jobs, contribute technological expertise and assume financial risk. This model is illustrated in all six of the PPP case studies examined for this paper.

Another PPP financing model refers to an arrangement where the local government enters into a long-term lease of a major asset, such as the passive infrastructure of a broadband access network, to a private company, transferring the right and responsibilities for the leased asset to the private company. Under this framework, defined as a public service delegation, a private player deploys broadband infrastructure with or without partial public subsidy, while assuming the risk. This is the case of the Debitex project.

Table 7 below presents some of the advantages and drawbacks of public-private partnership arrangements for financing broadband projects.

**Table 7: Advantages and Disadvantages of Public-Private Partnership Financing Models**

Model	Description	Advantages	Disadvantages	Examples Discussed
1. Debt-facilitation model	<ul style="list-style-type: none"> <li>Public entity facilitates access to tax-exempt financing from private sources</li> <li>No commitment to provide public funds</li> </ul>	<ul style="list-style-type: none"> <li>No public funds are placed at risk</li> </ul>	<ul style="list-style-type: none"> <li>Potential misalignment of objectives between parties</li> <li>Limited leverage of public party capabilities (Right of Way facilities)</li> </ul>	<ul style="list-style-type: none"> <li>Mesoamerican Information Highway (C. America)</li> </ul>
2. Debt-guarantee model	<ul style="list-style-type: none"> <li>Government guarantees debt, provided by private source</li> </ul>	<ul style="list-style-type: none"> <li>Access to better financial terms of debt</li> </ul>	<ul style="list-style-type: none"> <li>Guarantee means that public sector has assumed contingency liability so public funds are placed at risk</li> </ul>	<ul style="list-style-type: none"> <li>Cable San Andres (Colombia)</li> </ul>
3. Public service delegation	<ul style="list-style-type: none"> <li>Private sector deploys broadband network with or without partial public subsidy</li> <li>Private sector has a concession to resell the passive or active layers to service providers</li> </ul>	<ul style="list-style-type: none"> <li>All risk is assumed by private sector</li> </ul>	<ul style="list-style-type: none"> <li>Subsidy is needed to attract the concession holder</li> <li>Lack of commitment of project sponsor might result in service failure</li> </ul>	<ul style="list-style-type: none"> <li>Red Dorsal Peruana</li> <li>Red Azteca de Colombia</li> </ul>

Source: TAS LLC

The public service delegation model (such as the one implemented in Peru and Colombia for their backbone networks, and in France with Debitex) is particularly attractive insofar that it shifts the deployment and operations risks away from the public sector. However, the experiences of our case studies indicate that it is critical to ensure a high level of commitment on the part of the private co-sponsor because if the private party does not fulfill its obligations, the broadband project fails.

### 5.3. Operator-sponsored financing models

The incumbent funded broadband project, benefitting from the natural market advantage of a historically dominant player and access to capital, represents a low risk approach for broadband rollout. A broadband network sponsored by an incumbent is typically funded out of the capital

budget of the company, although it can be supplemented by targeted borrowing from a lender at a negotiated rate that reflects the company's WACC and a beta that accounts for project risk, or bond issuance such as the case of ETB in Colombia.

Two financing alternatives are potentially viable when it comes to incumbent funded models. Under the first option, the incumbent assumes primary financial responsibility for deploying ultra-fast broadband by leveraging a large market share position in a highly dense market. The examples in this context are that of Andorra Telecom, Lattelecom, and TEO. A relatively secure access to funds and the prospect of capturing a large portion of demand render this model attractive. The only reasonable concern would be a potential competitive response from a cable TV operator that could erode the revenue streams derived from the project and affect its ultimate profitability.

The second model, also viable, is one of competitive partnering. Two options have been identified in this area: the joint venture model (e.g. KPN/Reggefiber), and the multifibre model (e.g. Swisscom). Under the first one, the incumbent enters into a partnership with another player that is deploying fiber capacity. The cooperation is mutually exclusive with regard to the construction and operation of passive FTTH infrastructure. Each partner brings a set of capabilities to the venture. KPN offers direct access to its customer base for migration to FTTH, while lowering Reggefiber's costs of rolling out the network. Reggefiber brings expertise in building FTTH networks, as exemplified by a successful track record in project management. A slightly different alternative entails the cooperation of alternative carriers and incumbents. Such is the case of France Telecom and SFR in France sharing termination points of the fiber network and Deutsche Telekom and Net Cologne. While all four models are seen as potentially viable, they entail different advantages and disadvantages (see table 8 below).

**Table 8: Advantages and Disadvantages of Operator-Sponsored Financing Models**

Model	Description	Advantages	Disadvantages	Examples Discussed
1. Incumbent funded model	<ul style="list-style-type: none"> <li>• FTTH financing follows classical CAPEX rules of carrier, subject to conventional stand-alone capital planning rules and processes</li> </ul>	<ul style="list-style-type: none"> <li>• Flexibility to manage deployment according to stand-alone internal processes</li> </ul>	<ul style="list-style-type: none"> <li>• Competitive retaliation could potentially affect rate of return by forcing price reductions</li> <li>• Regulatory risk driven by wholesale access obligations</li> </ul>	<ul style="list-style-type: none"> <li>• ETB (w/bond issue) Colombia)</li> <li>• Seabras 1(Brazil-US) (with private lending)</li> </ul>
2. Competitive partnering model I (joint venture)	<ul style="list-style-type: none"> <li>• Partnering between incumbent and construction, or real estate company</li> </ul>	<ul style="list-style-type: none"> <li>• Complementarity of capabilities</li> <li>• Market risk mitigated by competitive co-optation</li> <li>• Ability to ring fence credit facilities using nonrecourse finance, which lowers investment risk and provides capital flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Need for regulatory endorsement</li> <li>• Obligation to provide open access</li> </ul>	<ul style="list-style-type: none"> <li>• KPN/Reggefiber (Netherlands)</li> </ul>

3. Competitive partnering model II (Multi-fiber model)	<ul style="list-style-type: none"> <li>• Incumbent assumes deployment responsibility</li> <li>• Costs are shared with competitors purchasing access to fiber pairs</li> </ul>	<ul style="list-style-type: none"> <li>• Market risk mitigated by competitive co-optation</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory risk prompted by alternative carriers</li> <li>• Potential limited positive response on the part of envisioned partners</li> </ul>	<ul style="list-style-type: none"> <li>• Swisscom (Switzerland)</li> </ul>
4. Competitive partnering model III (Cost-sharing model)	<ul style="list-style-type: none"> <li>• Partnering between incumbent Telco and alternative providers</li> <li>• Agreement to deploy independently and grant bit-stream access to each other</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in capital investment in low density areas</li> </ul>	<ul style="list-style-type: none"> <li>• Need to gain regulatory endorsement</li> <li>• Technology choice can be complicated by divergent partner strategies</li> </ul>	

Source: TAS LLC

Under the operator-funded model combined with a public policy stimuli approach, national governments decide to intervene through grants or low interest loans directly in the deployment and management of a national fiber optic network. In this case the government is acting more as a catalyst by dedicating a special fund to help financing neutral open access model, most of the time being at a regional or municipality level (e.g., National Very High Speed Plan in France, Broadband Delivery UK plan, Municipal FTTH investment in Sweden). Under this model, the operator assumes primary funding responsibility but is influenced by several initiatives aimed at improving a potentially unattractive business case (e.g., demand aggregation, reduced property taxes, grants to cover capital expenditures, etc.).

#### 5.4. Most appropriate financing models

As the assessment of advantages and disadvantages of financing models by type of project has indicated, there is no single financing structure that can be applied to all projects. However, within each category of the project taxonomy set forth in this study, some financing approaches appear to be more likely to result in the success of the broadband project.

- In the case of local and regional public initiatives for urban and suburban rollouts, the approach where the municipality or departmental government acts as an investor for an open access network, securing initial funding at low rates for construction that is guaranteed by the public entity appears to be the most suited model. Stockab, the fiber network of the Stockholm metropolitan area is an excellent example of this model.
- If the rollout takes place in rural areas, it is useful to gain access to public funds through either government program grants and/or credit facilities from development finance institutions, such as the World Bank, the CAF and European Investment Bank. These can be complemented with loans from private lenders with terms similar to those of the public institutions, often facilitated by partial credit guarantees. An additional potential model using pooled financing to support roll-outs in small rural municipalities is described in detail in the following section on recommendations.
- Public private partnerships following a public service delegation model could be suited for rural areas, insofar that this framework allows shifting the market risk to the outside entity.



- In terms of operator-funded models, there is no single model. In high-density urban areas, rollouts supported exclusively by an incumbent are possible, although the investment case is always subject to competitive retaliation risk. To moderate this last factor, joint ventures under open access rules or multi-fiber models are appropriate.
- Finally, in rural settings, cost-sharing models between competitors are probably the only option. There might some cases, whereby even a shared approach is not enough to ensure success. In this case, the use of public funding programs in the form of low interest loans to operators might be the only alternative.

### 5.5. Conclusion

As evidenced by the representative case studies in this study, there is no unique financing model to fund the deployment of broadband. At the highest level, we have identified three different intervention models that have been implemented. While some of them can be more appropriate than others, it is safe to conclude at this point that the optimal model depends on the characteristics of the market in which it is applied. For example, the publicly-owned utility model (e.g., Verkkö-osuuskunta Kuuskaista, Oberhausen an der Donau, and Asturcom) appears to be the best suited to fulfill the requirements of rural environments. However, the overarching objectives of policy makers could push this model as well to be implemented in urban contexts (e.g., Stokab).

In the case of urban and suburban markets, the incumbent-sponsored model (e.g., Andorra Telecom, TEO, Lattelecom) or the competitive partnering scheme (e.g., Swisscom, KPN/Reggefiber) appear to be most suited. The alternative operator model (e.g., Reso-LIAIN) appears to be more prevalent in suburban settings.

However, financing models need to be assessed not only in terms of how suitable they are in each geography, but also in terms of their reliance on equity, debt or public funds. The financing structure can ultimately have an impact on the project viability as well as the stress they might impose on the providers of funds. Along these lines, there is an implicit advantage of relying on public lenders such as the CAF. In the first place, they tend to have a pricing advantage over commercial lenders, derived from their credit rating and non-for-profit operating model. In addition, they tend to offer longer maturity products of 10 years and more. Indirectly, public lenders can contribute with much needed project development support, technology and industry expertise to new entrants, such as municipalities or energy utilities. Finally, their participation in a project provides a signaling effect to other lenders that can be convinced to extend credit due to the credibility stamp that some of these public lenders can provide.

## 6. PRACTICES CONTRIBUTING TO MITIGATING PROJECT FINANCIAL RISK

The analysis of a wide spectrum of broadband projects enables the identification of a number of practices that can contribute to mitigating project financial risk.

### 6.1. Careful development of business plan

The success of a broadband project, as with all new start-up, is predicated on the development of a carefully developed business plan. The business plan is the appropriate instrument to capture all the contextual factors (e.g., competition, primary demand, price sensitivity), and define a ramp-up strategy that supports the financing strategy. A carefully developed plan (often done with the assistance of an outside expert in the field) will substantially increase the probability of success of the project.

The projects selected for this study, as well as our prior experience, indicate that many shortfalls in broadband rollouts can be explained by mistakes incurred in the development of the business plan. They range from excessive optimism in estimating the number of subscribers to be signed on, to over-estimating the subscriber willingness to pay for service, or under-estimating the competitive threat. In the search for funding, some project sponsors might be inclined to over-estimate the penetration ratio or under-estimate average revenue per user (ARPU) in order to depict a more optimistic demand curve, making the project more attractive to the providers of credit. Since the availability of funds depends on the availability to convince providers of funds that the project is technically feasible and economically viable, it is not uncommon to observe over-optimism in the formulation of the business case resulting in wrong assumptions underlying the financial model.

Compounding over-optimism in the development of the plan, project sponsors tend to underestimate at times the competitive retaliatory threat. Even under open access business models, incumbents might be inclined to enter a moderately attractive market to raise barriers to competitors. Once this occurs, price competition and share erosion become critical concerns, which lead to potential inability to service debt.

Some of these shortfalls can be identified at the due diligence phase by the outside party retained to validate the business plan and identify market, technology and credit risks. However, it is not uncommon to observe that due diligence parties either conduct a cursory assessment of the business case and financial model or are subject to pressure from lenders to avoid sufficiently stress-testing the business plan, thereby opening the way to potential project failure in the long run. Even in case that the primary funding source comes from a public subsidy; sponsors need an accurate and realistic business plan to ensure long-term project viability and sustainability.

## 6.2. Careful assessment of project risks

The due diligence process serves as the key checkpoint that all business assumptions and risks have been carefully considered and anticipated at time of development of business plan. It is important that the risk assessment includes all potential areas including:

- Completion risk (construction)
- Technology risk (substitution, premature obsolescence, replacement costs)
- Pricing risk in the supply of equipment
- Economic and financial risk (stress testing the business plan)
- Currency fluctuation risk
- Political and regulatory risk
- Environmental risk (for example, trench digging)
- Force majeure risk

The project risk assessment should serve as a basis to the development of a risk mitigation plan, and drive the stress testing of the financial model and debt service coverage.

## 6.3. Demand aggregation to achieve initial critical mass

The most critical time in terms of broadband rollout is project launch, when construction has been completed and sponsors are making payments to service debt before enrolling subscribers. Demand aggregation, both of public agencies, businesses and consumers across neighboring areas is a useful initiative to gain access to “anchor tenants” that can generate revenue streams from the start. Demand aggregation has to be conducted in anticipation or in

parallel with network construction to make sure that a critical mass of subscribers can be committed at time of launch.

#### **6.4. Search for agreements to share deployment costs**

From the assessment of suitable models, it became apparent in the study that, given the high levels of investment required for rolling out fiber, all parties should consider the possibility of sharing costs. The ongoing experience of competitors willing to engage in cooperative practices indicates that there is less of a fear of loss of competitive advantage if two parties serving the same market agree to cooperate in the deployment of infrastructure, insofar that they continue to compete at the upper layers of the network.

#### **6.5. Secure a third party in search and negotiation of appropriate funding**

In some cases, project sponsors avoid retaining a third party (financial advisor) that will help them search and negotiate financial terms. We believe access to capital remains a fairly opaque domain. An inexperienced player search for funds might not have a chance of obtaining the best possible terms from the better sources. Mistakes in this regard can result in additional interest costs in the long run or the possibility of not securing more lenient covenants. As indicated below, it is recommended that an agency of the national government or a public lender play a key role in terms of providing technical assistance and conducting due-diligence of business plans in preparation for the definition of suitable funding models.

#### **6.6. A special recommendation to local governments**

It is very common that investment models at the municipal level are driven by “build it and they will come” considerations. These models assume that if a municipality over lays their FTTx network on top of existing service providers, albeit of a lower quality (e.g., ADSL), consumers and businesses will change their existing providers and subscribe to the services offered by the municipality. This is not the case in many situations. Stickiness of incumbent services, concern about quality of service, and even pricing could be some of the barriers to switching to the new municipal service.

In this context, rather than deploying FTTx just for the sake of technology, local governments should pay attention upfront to the understanding of their “market,” and thinking of technology as a tool to meet unaddressed users’ needs. This should be complemented with active education and awareness campaigns promoting the benefit of high-speed connectivity for consumers and businesses. Finally, the rollout plan should include the provision of affordable hardware and the offering of services at lower rates for the economically disadvantaged. Some of this could be supported through “output-based aid” mechanisms, where hardware acquisition to the disadvantaged population who cannot afford to pay market price is underwritten by public subsidies.

From a financing standpoint, municipalities should structure funding to anticipate equipment and infrastructure life. Along these lines, replacing infrastructure in five years is acceptable, as long as it was not financed for twenty years. In addition, municipalities should be careful to avoid speculative infrastructure investments that do not consider the long-term debt implications.

In general terms, local governments should be very careful in examining financing options, by researching the type of financing models being considered, understanding the rights and obligations of the local government and the potential private partner, and setting the standards for public financial commitments. It is always important to conduct these activities in

consultation with appropriate third party technical experts that can provide independent high-quality advice.

### 6.7. Develop pooled financing approaches to support small-scale broadband projects

Small broadband projects are difficult and costly to finance individually. In some cases, small municipalities cannot gain access to support from development finance institutions (such as the IDB, CAF or EIB) because the small financing amounts for individual projects are small while transaction costs remain high. In those cases, the municipality is obliged to seek financing from commercial banks that will share similar concerns.

To address this situation, public lending institutions could develop an approach that pools a number of small projects, and negotiates financing for the pool as a whole. In fact, a pooling structure makes it easier to attract lenders and helps to spread the transaction costs among a number of borrowers.<sup>10</sup> As a side benefit, a pool of loans could also be more attractive to commercial lenders because pools can reduce risk through diversification, spreading the risks of debt repayment interruption or default. Pooling a number of project loans therefore diversifies the credit risk for lenders and increases return.

The benefits of the proposed project pooling structure are manifold:

- Small broadband projects can be financed without reliance on the financial abilities of local governments or the central government;
- Small projects could attract funding at more lenient terms than if they were to go individually to the private debt markets, as development financial institutions and governments can provide project development support, partial credit guarantees, first loss facilities, and other support as needed;
- Financial accountability and transparency will be assured by the lenders to the pooled facility because all projects included in the pool will be structured on a project finance basis with complete documentation, business plans, contracts, and financial models; and
- Private lenders will gain experience in financing broadband projects, which will help them gain a better understanding of the sector, how to mitigate risks, and make them more inclined to scale up financing of broadband projects over the longer term on an individual project basis.<sup>11</sup>

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<sup>10</sup> Pooled facilities and related financing mechanisms have been developed and used in a wide range of countries. Examples include the United States (state bond banks, water and waste water treatment revolving loan funds, equipment lending pools); Kenya (K-Rep Bank pooled water facility); Czech Republic (MUFIS); South Africa (MIU); India (Tamil Nadu pooled water facility); and other applications in the Philippines, Colombia, and Morocco. Two of the earliest examples were the Infrastructure Finance Corporation of South Africa (1996) and Infrastructure Development Finance Company of India (1997). Other more recent examples are the Central American Mezzanine Infrastructure Fund (2008) and the Central American Mezzanine Infrastructure Fund II (2013). For field tested approaches, see "Financing small-scale infrastructure investments in developing countries" by Daniel L. Bond, Daniel Platz and Magnus Magnusson, DESA Working Paper No. 114, ST/ESA/2012/DWP/114, May 2012, [http://www.un.org/esa/desa/papers/2012/wp114\\_2012.pdf](http://www.un.org/esa/desa/papers/2012/wp114_2012.pdf)

<sup>11</sup> For more details, see

## 6.8. Principles of successful public private partnerships

In general terms, successful public private partnerships entail a number of principles that go well beyond the financial dimensions. Of course all principles that apply to the financial cooperation and implementation should be followed closely in order to contribute to the broadband project's success. In addition, all partners need to openly share Strategic Plans and Missions, Goals and Objectives serving as a basis for the partnership. In the development of the business plan for the partnership, it is crucial to identify common interests (e.g., project failures or overruns, lessons learned). Once the project is under development, it is also imperative that all partners develop and share a dynamic day-to-day monitoring process to track performance of the project in all dimensions against milestones and formulate ways to adjust the business plan as needed.

## 7. CONCLUSION

The success or failure of a broadband deployment project is primarily a function of two factors: the investment model that assesses the financial viability of the venture, and the financing model. The investment model comprises all the revenues, capital and operating expenses assumptions and provides the classical metrics of business viability, such as internal rate of return and net present value. The financing model addresses the approach that will be followed to fund the required investment to roll out infrastructure. The investment model assumptions and funding assumptions are constrained by a number of project contextual variables, comprising the competitive environment and players driving the fiber rollout.

The competitive environment represents a critical variable influencing the expected evolution of the subscriber base and average revenue per user. As such, these variables have a direct impact on the ability of the project sponsor to service its debt.

On the other hand, as mentioned above, different broadband project sponsors exhibit different investment and funding constraints. For example, a municipality generally invests in relatively small projects, with a long-term investment horizon. An alternative operator has a shorter time frame driven by potential exit strategies, aggravated by limited available equity and reliance on debt. A telecommunications incumbent has the advantage of an existing broadband customer base, which can be migrated to the FTTH offer. However, this can be mitigated by the fact that the carrier already has a network (whose services are going to be cannibalized by the FTTH ones) and the short-term perspective of public shareholders (that can penalize the carrier for overinvesting in infrastructure to the detriment of dividends).

Following these guidelines, a municipal-sponsored project in an area with no broadband or limited service embodies low investment risk. Similarly, the roll-out by an incumbent in an area where the only service is its own ADSL exhibits somewhat higher risk than the prior example as a result of the cannibalization and potential for price-shifting (defined as heavy discounting to stimulate uptake of FTTH by existing ADSL customers). On the other hand, an FTTH rollout by an alternative operator in a territory already served by a player offering VDSL and/or Docsis 3.0 represents a high-risk venture.

Between, these two extreme points, a range of medium risk alternatives exists. First, the incumbent roll-out of FTTx facing Docsis 3.0 represents a competitive retaliation proposition, whereby the incumbent's project risk is somewhat mitigated by typical infrastructure renewal (e.g., copper replacement) and customer migration dynamics (e.g., existing customer base). Second, the rollout of broadband by an electric utility, a municipality or local government in direct competition with existing players offering high-speed services represents medium risk. In this case, open access business models represent a suitable way of controlling risk.

In this context, certain financing structures appear to provide more flexibility to sustain the profitability erosion. For example, if a broadband rollout is funded to some extent through debt, profitability remains a primary concern for the lenders. Under this scenario, the service provider is squeezed between the need to preserve margins to generate sufficient cash flow to service the debt and the imperative to drop prices (thereby reducing ARPU) to either gain share or respond to competitive substitutes.

As such, the incumbents that do not need to appeal to the debt markets to fund their rollout could have some flexibility and advantage. Alternatively, municipal open access networks have fewer constraints on financing given their ability to fund investment from cash flow. On the other hand, alternative operators face higher investment model risk, which would affect their financing strategies.

However, financing models need to be assessed not only in terms of how prevalent they are in each geography, but also in terms of their reliance on equity, debt or public funds. The financing structure can ultimately have an impact on the project viability as well as the stress they might impose on the providers of funds. Along these lines, there is an implicit advantage to rely on development finance institutions such as the CAF, IDB, and EIB.

At a detailed level, the analysis of case studies enabled the identification of eight suitable broadband financing models:

- Urban and sub-urban municipality acting as an investor
- Rural municipalities supported by public and private credit financing
- Public service delegation as a form of Public Private Partnership in rural areas
- Incumbent funded project in urban-suburban settings
- Joint venture across competitors in urban-suburban areas
- Multi-fiber models in urban and sub-urban areas
- Cost-sharing models across competitors in rural geographies
- Operator funded supplemented with public funding programs for rural areas

While some of them can be more appropriate than others, it is safe to conclude at this point that the optimal model depends on the characteristic of the market in which it is applied. For example, the publicly-owned utility model appears to be the best suited to fulfill the requirements of rural environments. However, the overarching objectives of policy makers could push this model to be implemented in urban contexts as well. In the case of urban and sub-urban markets, the incumbent-sponsored model or the competitive partnering scheme appear to be most suited. The alternative operator model appears to be more prevalent in suburban settings.

It is clear that the most favored funding model is the one that is based on public funding due to the more favorable financing terms. This allows even broadband projects with investment model metrics below benchmarks to mitigate their financial risk. Beyond this structure, projects that are primarily funded through equity of the incumbent exhibit lower risk, unless they persistently face investment model metrics below benchmarks. This needs to be balanced with the equity having a higher cost of funding than debt. Moving to the next funding model structure that balances debt and equity in roughly equal parts, projects exhibit moderate to low risk if the investment model metrics are either evolving or higher than the benchmarks. If the project metrics are below benchmarks, the obligations of servicing the debt will affect the risk profile.

Finally, a number of practices that contributed to enhancing or mitigating the project financial risk were identified. Among the practices contributing to the success of a project financial strategy, we have identified the opportunity to aggregate demand to achieve critical mass, share deployment costs across players, implement an open access business model, fund roll-out from CAPEX (in the case of incumbents), careful development of a business plan, and the conduct of a due diligence by qualified third party experts. Conversely, the practices that might contribute to a project failure comprise limited support to negotiate financial debt terms, little focus on the project's business plan, over-optimism in assessment of customer acquisition, and lack of commitment from the project sponsor. A pooled financing model targeted to small municipalities has also been recommended as an option worth exploring.

**Appendix A:  
Comparative Data on Representative Sample of Broadband Projects**

Project	Country	Year Launched	Business Model	Project Cost (US\$ million)	Loans/Bonds
Red Dorsal	Peru	2015	Backbone	\$ 3	...
Red Azteca	Colombia	2013	Backbone	...	...
Mesoamerican Information Highway	C. America	2010	Backbone	\$ 494	...
Internexa Brazil	Brazil	2012	Long Haul	\$ 320	....
Argentina Conectada	Argentina	2012	Backbone	\$ 1,001	0
Seabras 1	Latam	2013	Submarine Cable	\$ 425	\$ 290
Cable San Andres	Colombia	2013	Submarine Cable	\$ 63	\$ 10
ETB	Colombia	2013	Incumbent	\$ 210	\$ 210
Stokab	Sweden	1996	Open Access	\$ 685	...
Kuuskaista	Finland	2002	Municipal	17.08	17.06
Reso-LIAIN	France	2006	Open Access	115.60	115.6
National Very High Speed Plan	France	...	Public Funding		
Broadband Delivery	U.K.	2010	Public Funding		
Oberhausen an der Donau	Germany	2010	Municipal	5.44	5.44
Debitex Telecom	France	2000	Open Access	54.80	54.80
Asturcom	Spain	2005	Open Access	74.80	74.80
Swisscom	Switzerland	2009	Multi-fiber	2,720	0
Latt telecom	Latvia	2008	Incumbent	56.56	0
Andorra Telecom	Andorra	...	Incumbent	47.60	0
TEO	Lithuania	2008	Incumbent	134.64	0
KPN/Reggefiber	Netherlands	2008	Open Access	1,292	775.20

Source: TAS LLC



