Consulting

FTTH Council Asia Pacific

2009 Market Studies

To the attention of FTTH Council Asia Pacific

Roland MONTAGNE

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I - The impact of the economic crisis on telecom investment in Asia Pacific

Key findings

The global economic downturn produces various effects in the Asia Pacific regions:

- access to foreign capital and export opportunities, which were two driving factors for regional development, are now constrained,

- as anywhere else, local companies aim at making their activities more efficient with reduced operational costs and more targeted investments.

However, economic prospects remain higher than in most other regions of the world and demand for advanced telecom infrastructure and services in particular is still strong as they appear to act as a leverage for economic recovery.

Broadband should act notably as a stimulus for regional development, supporting fast growing exchanges within and between local players and facilitating the use of new processes, such as outsourcing or virtualization.

Thus, it is key to maintain investments in this area and, at a time when private investors are very cautious about expenditure, the support of governments is more than ever needed, especially for fiber access networks, which require huge amounts of money for deployment.

Finally and according to our economic analysis of the APAC region in 2009, we have identified here large to small markets presenting strong potential for FTTH.

1. Introduction

A lot of plans for FTTx deployment plans have been launched or announced in the Asia-Pacific region over the recent past. Japan is now the world leader (in terms of subscribers), with fiber deployments beginning in the 90's and investments intensifying in the early 2000's. More than a quarter of all households are equipped with FTTx access, putting Japan among the countries with the highest penetration rates. At the end of 2008, over 45% of broadband internet connections in the country were via FTTH/B.

South Korea was also a pioneer market for very high speed access. Already back in 2003, subscribers began switching gradually from ADSL to VDSL. At the end of 2008, the country was home to 6.76 million FTTH/B subscribers, out of a total of roughly 15 million homes passed: 90% of households in South Korea have access to an FTTH/B offer.

In those countries, the massive development of FTTx can be attributed partly to the high population density and concentration in urban areas (81% of the country's population lives in a urban area in South Korea), the large number of high rise apartment buildings and proactive government policies. Complementary reasons (notably competitive pressure over NTT and potential for aerial rollouts) can explain why FTTx could develop so strongly in Japan:

Deployments are also well advanced in some smaller countries, such as Hong Kong and Taiwan while large programmes were initiated more recently in other countries of the Asia-Pacific region: China, New Zealand and Australia notably.

In particular, some governments, citing the importance of broadband, have recently invested public funds to address important communication market limitations. These investments fall into two general categories: extending access to unserved/underserved communities and upgrading networks with very high speed lines capable of supporting competitive services in regions and municipalities. Announced government stimulus spending on communication infrastructure will largely target these two types of investment.

However, the financial crisis and the global economic downturn should affect telecoms development programmes, not only in advanced markets but also in developing countries and regions for which investments in new infrastructure and services are critical. This paper examines the impact of the crisis on business and on investments for the telecoms industry in Asia-Pacific and highlights FTTH opportunities in the region.

2. Macro economic effects of the crisis on the telecoms sector

It was traditionally thought that the telecom industry would be spared from the impact of economic crisis. However, it is increasingly evident that telcos are getting impacted due to restricted access to capital and consumers limiting their usage.

2.1. Access to foreign capital

Compared with other infrastructure investments in developing countries, FDI (Foreign Direct Investment) plays a very important role in telecommunications. Reliance on foreign investment has been particularly high in Latin America and in Africa but also in many emerging markets across Asia where operators are small and dependent on capital from other economies, in the region (Singapore, Malaysia) or outside (Middle East, Europe) to expand.

Top 6 Foreign Investors in Telecoms Infrastructure in Developing Asia, 1996-2006

Investor	Country of origin	Investment commitment (million US$)
Telekom Malaysia	Malaysia	3,575
Khazanah Nasional	Malaysia	2,337
Telenor	Norway	2,080
Abu Dhabi Group	U.A.E.	1,693
Singapore Telecom	Singapore	1,369
Maxis Communications	Malaysia	999

Source: UNCTAD (World Investment Report 2008)

As regards the Asian region more specifically, we can observe that South-South investments have been significant over the past 10 years (see table above). Looking back to what happened in the early 2000s after the internet bubble burst, this can partly explain why FDI flows in developing Asia did not decrease. As demand for telecommunications infrastructure and services remains high in the region (see part III.), confidence from foreign investors could lead again to sustained investments despite the global crisis: in particular, there could be good opportunities for those transnational investors which are backed by home-country governments with large current account surpluses (e.g. in the Middle East or in China). However, private investors should be more encouraged to support operations with short term returns such as mobile networks while public investments should be necessary to deploy wide wireline infrastructures. These deployments are of particular importance as Asian emerging countries are generally only little equipped with fixed lines. In India for instance, fixed teledensity was only 3.3% (3.3 fixed telephone lines for 100 inhabitants) at the end of 2008; it was 4.5% in the Philippines and 9.4% in Indonesia. This compares with 30.2%, 70.9% and 63% for mobile density in the same 3 countries.

2.2. Capital constraints

Telecommunication investment has been particularly sensitive to changes in the economic climate over the past 20 years. As shown in the graph below, growth of GDP and growth of telecommunication investment for the OECD between 1985 and 2007 have had similar profiles but the changes in investment are greatly amplified (as noted by the scale on the right axis) when compared to changes in GDP (the scale on the left axis). A 1% change in GDP corresponds roughly to an 8% change in telecommunication investment.

Figure 1: Telecom investment and nominal GDP growth, total OECD, 1985-2007
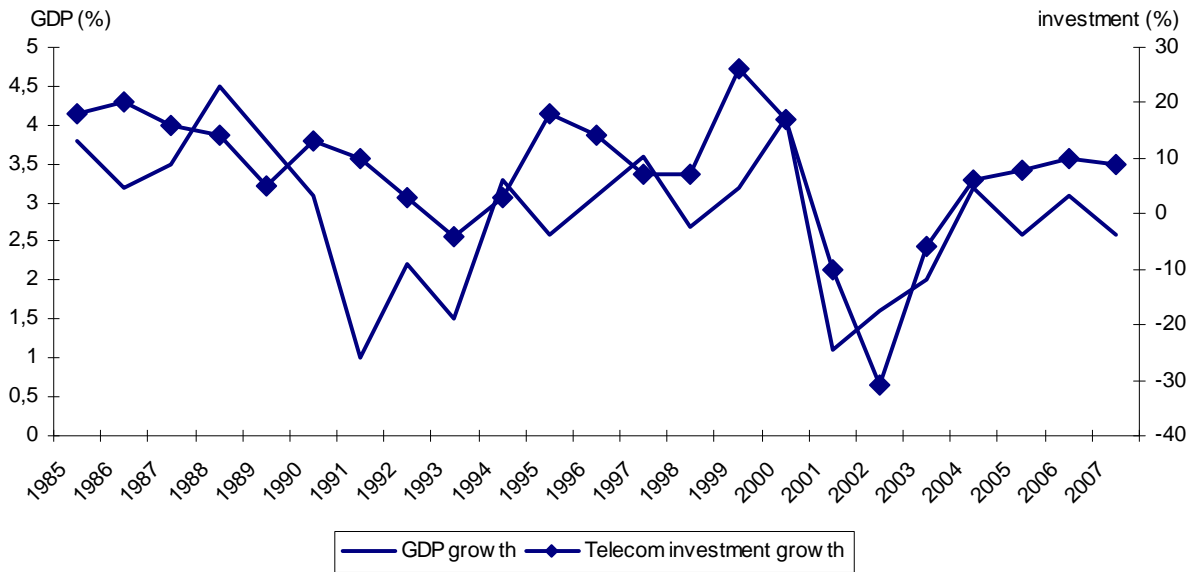
Source: OECD

Over the recent past, operators have paid particular attention to CAPEX as they intended to maintain operating margins at a time when revenue growth was decelerating. But expenditures could continue to increase, especially in Asia Pacific as local markets were still growing fast (+10% per year in China over the 2003-2007 period, +19% in India; even over 25% in Indonesia or in Vietnam): regional CAPEX market share increased by 3% of the worldwide CAPEX in 2007 compared to 2003 reaching €56.2bn.

Figure 2: Telecom carrier capital expenditures allocation per geography, 2003-2007
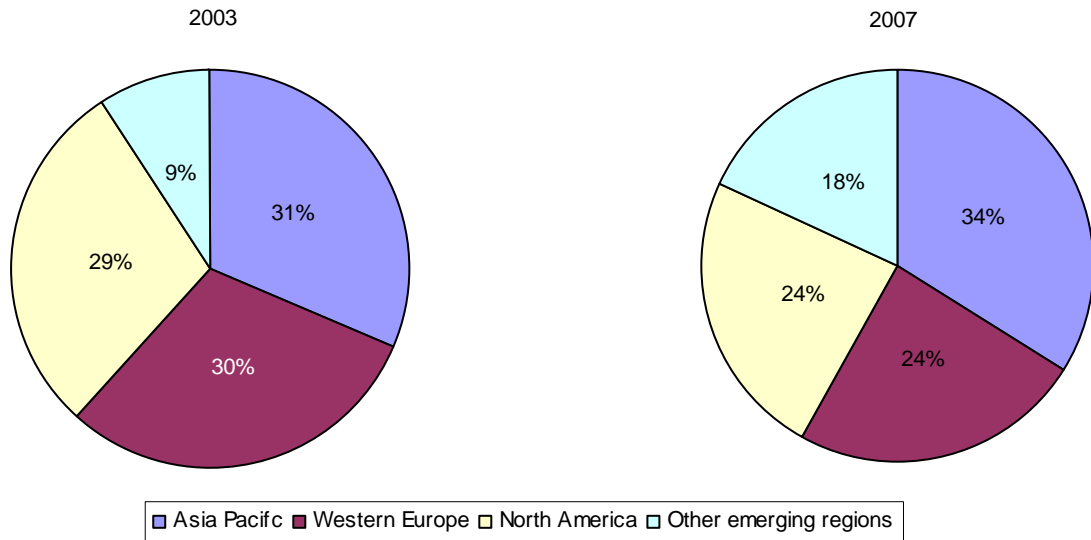
Source: IDATE

The Asia Pacific region is not the fastest growing one but still grew at 18% rate for mobile CAPEX and 9% rate for fixed CAPEX in 2008, with Japan, China and India operators spending about 77% of the total investments for fixed networks in the region.

Overall, we expect CAPEX to be constrained by the grim economic climate in 2009. At least in the next 3 years, the traditional CAPEX will experience an average annual decline of 3 to 4%, which forebodes a turning point for industry transformation. However in the emerging Asia-Pacific region, CAPEX in telecom networks should continue to grow as major local telcos (China Mobile, Bharti in India, Digitel in the Philippines, etc.) will keep investing significantly to increase coverage and capacity in underserved areas. Furthermore, when revenue from voice services and traditional CAPEX cannot cover operators' total cost of ownership (TCO), new services and new investment will become new opportunities and breakthrough points.

Figure 3: Fixed CAPEX in Asia Pacific (million USD)
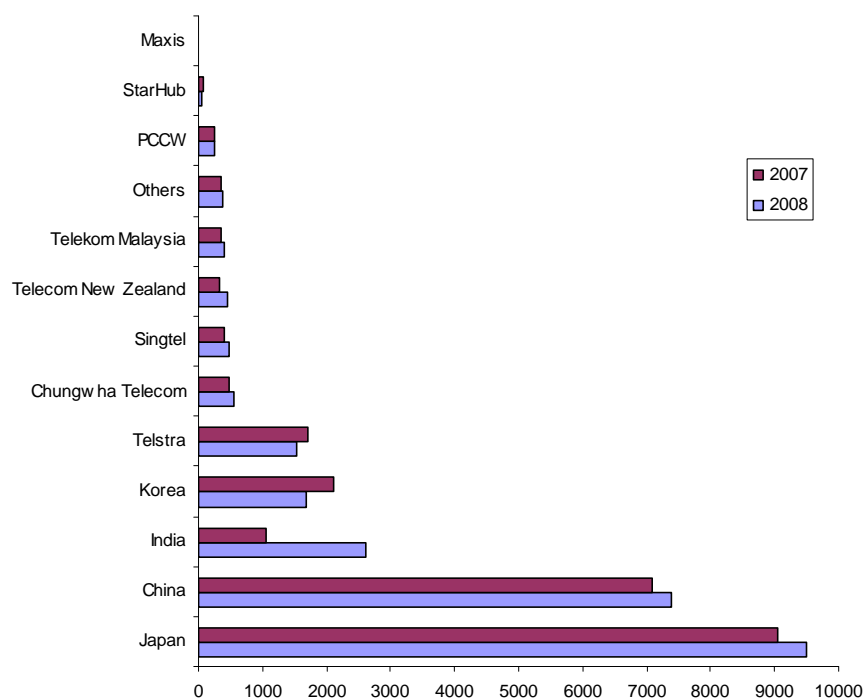
Source: IDATE

In their search for sustainable revenues and a way out of the sector's mid-life crisis, telecoms companies have increasingly focused on broadband. The rising demand for bandwidth has become a source of growth, but as prices tumble and competition increases, bandwidth is rapidly becoming commoditised in the advanced economies and even in some of the metropolitan cities of developing countries. There are limits to growth with the rise in the proportion of homes and offices serviced and among users upgrading to higher bandwidths, so this ultimately becomes a low-growth, albeit sustainable, opportunity. This is the right time to move to new business models to increase services consumption. Enhanced service consumption will ultimately benefit the carriers when the things start to improve.

The operators are constrained not only by the capital for investment but also by the lack of working capital. International long distance carriers are likely to see sharp fall in the traffic, due to lower IT spending and lower cross-country investments, which is unlikely to be compensated by the increase in traffic due to travel restrictions across the companies. The operators may resort to tariff reduction in a bid to increase the minutes of usage (MoU) but this would restrict their ability to offer flat data prices or other innovative data models. Consolidation should continue and maybe intensify amongst carriers as the weaker ones bow out of the industry.

The operators would do well by concentrating on cost reduction initiatives. They may follow the initiatives of the Indian operators by adopting light-asset operation models, putting greater pressure on equipment vendors to adopt new models like managed service and capacity service. The carriers would also do well by actively engaging in all kinds of infrastructure sharing opportunities. The cash rich operators may look for new M&A opportunities and cash strapped carriers will do well by limiting the handset subsidies.

3. Micro economic effects

The long term economic prospects in the region remain very promising. In such economic times, carriers are expected to continue to invest in next generation networks (see above) and enterprises to focus on technologies that will allow them to drive cost efficiency, in particular through the use of communication networks which can allow them for more flexibility and economies (economic savings).

The global economic slowdown has affected the telecom service providers (SPs) in different ways, depending on their market share positioning and/or financial health. It also depends on the depth of the recession and we do not know exactly now the extent to which it will affect the local economy and when and at which pace it will recover. We can differentiate between two economic scenarios leading to graduated changes in consumer behaviour. In a "simple" recession scenario,, consumers are expected to be more careful about signing up for new services and SME and large entperprises will curtail spending growth in new telecom bandwidth and networking infrastructure. In a "severe" recession scenario, markets will be characterized by significant job losses and bankruptcies among enterprises. This will result in contraction in both telecom bandwidth and networking spending with carriers delaying roll out of new emerging technologies because of delays in adoption by weary consumers.

3.1. Cost management efforts

As regards businesses, the immediate response to the current economic slowdown will be largely focused on cost management. They will be more conservative in general in their spending including ICT. Cost management is critical to ride the current crisis but due to the longer term growth potential of the Asia-Pacific region, expenditure will remain at high level.

The increasingly distributed nature of the enterprises and the workforce, tightened budgets for business travels and budget freeze for recruitment are challenging the smooth flow of business processes and collaborations. These limitations have forced enterprises to rely more on technologies to facilitate collaboration. The need for collaboration is indeed the most compelling driver for adopting unified communications.

Enterprises are increasingly faced with various datacenter issues ranging from physical land constraints, extra applications added onto existing networks, increase in the number of branch offices being spread across the region, to environmental issues with power consumption and cooling. As the economy tightens, enterprises in the Asia-Pacific region will fundamentally rethink their datacenter strategies, and consider the managed services option in order to drive cost down. For most of them, the cost of running and operating a datacenter is one of the most resource draining and expensive endeavours. With the economic downturn, IT managers are faced with the challenge to balance the need to lower overall operational cost and to deliver improved applications performance. Organizations familiar with server and storage virtualizations will start to turn to the networks for further cost savings. Network will be the next frontier in datacenter virtualization.

Also with the tightening of budgets, end users (not only businesses but residentials as well) will seek alternative telecom devices and services. The selection of what is affordable and beneficial may range from choosing the better service option, to picking out the more practical telecom products and services. Broadband and mobile subscribers will find affordable ways to stay connected. End users will select low-end and mid-end mobile devices over high-end familiar brands[1]. There will be added interest in new brands that provide cheaper options.

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[1] That is certainly a bit different from what can be seen in mature markets where low-end and very high-end (smartphones) mobile devices remain popular at the expense of mid-range handsets.

3.2. Flexibility before need for bandwidth

However, mobile networks can also prove more economical for day-to-day business. Many small companies have leveraged the available 3G networks and the existing mobile broadband using HSPA technology for their mobile network. This can make better business sense as opposed to paying for a more expensive fixed-line business broadband access. Although WiMAX network offers the same promises as HSPA/HSDPA network, the full prowess of this technology will not be seen until the appropriate business model and pervasive coverage area are established.

Thus, wireless broadband access will be one area that can resist the economic condition. Strong demand and continuing marketing efforts from service providers have led to the growth in wireless broadband within the metro area and its surrounding cities in Asia-Pacific countries. With the advancement of new technologies like 3.5G, the impeding launch of WiMAX in some countries and the entry of new service providers, the wireless broadband market is expected to maintain its vibrancy in the short term.

Before the global economic downturn, Asia-Pacific countries were a different stages of rolling out emerging telecom technologies notably 3G/3.5G and WiMAX. The market will certainly continue to see investments in these technology areas in the short term, particularly from major service providers that can continue to afford investments in strategic long-term technologies. Similarly, milestones set for these technologies will likely be achieved in 2009, for example, awarding of 3G licenses in Thailand and Vietnam, WiMAX licenses in Thailand, and the commencement of commercial services availability in the Philippines.

Wireline operators are faced with the challenge to meet the demands coming from both the residential areas and business sectors. Bandwidth growth is now higher than ever. The continual rollout of Standard Definition TV (SDTV), High Definition TV (HDTV), Video on Demand (VOD), and more matured Metro Ethernet services have forced the operators to cater for heavier data transactions in the network. Intelligent solutions (such as Reconfigurable Add-Drop Multiplexers) will be required to help the network owners.

Figure 4: Comparison of outsourced network management by region
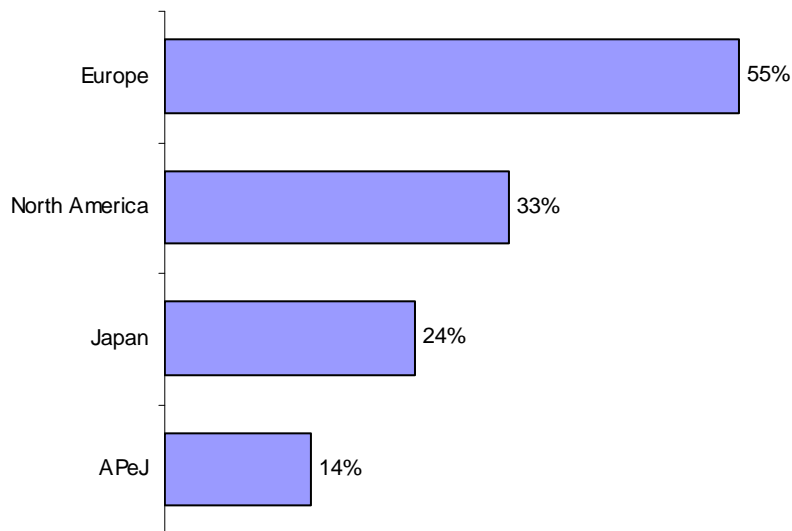
Source: IDC MNC Buying Behaviours, July 2008

4. FTTH opportunities for Asia Pacific

Opportunities will remain in Asia Pacific, even in the short term, as:

- most local markets, especially emerging countries, will still be dynamic with double-digit growth rates in services for part of them (Indonesia, Vietnam in particular) and just over or close to 5% for others (Malaysia, Philippines, Thailand)

- telecom operators will rethink strategies in the downturn and prepare for the upswing: the global economic slowdown will affect the Asia-Pacific telecom sector, but to a lesser extent than the IT markets. Telecom market players in the region will reassess their strategies and reconsider CAPEX plans, marketing strategies and product focus. Incumbents with healthy balance sheets will be able to focus CAPEX on enhancing core and backhaul networks and be farther ahead of their competitors once the economy recovers. Consumers or enterprise tier-2 operators, on the other hand, will have to focus on investments that will see faster returns. Meanwhile, the economic situation will present opportunities for operators with facilities and funds available to begin diversifying into higher value consumer and business services.

- SME will become the main focus of incumbent service providers: as the financial crisis will dampen any prospects of growth within the large corporations in the short term, incumbents will pay renewed attention to SME with dedicated marketing and product development initiatives. Any recovery that happens is always through the SME sector first.

4.1. Local emerging economies still dynamic

Deteriorating global prospects have soured the outlook for developing Asia in the next two years. GDP growth is projected to reach only 3.4% in 2009, which is nearly 3 percentage points slower than the 2008 rate, with every subregion hit. On the assumption that the global economy makes a mild recovery in late 2010, regional growth is projected to improve to 6.0% next year. Thus growth over the next 2 years is likely to stay well below the recent historical trend (see figure below).

Figure 5: Five-year average and forecasts of GDP growth
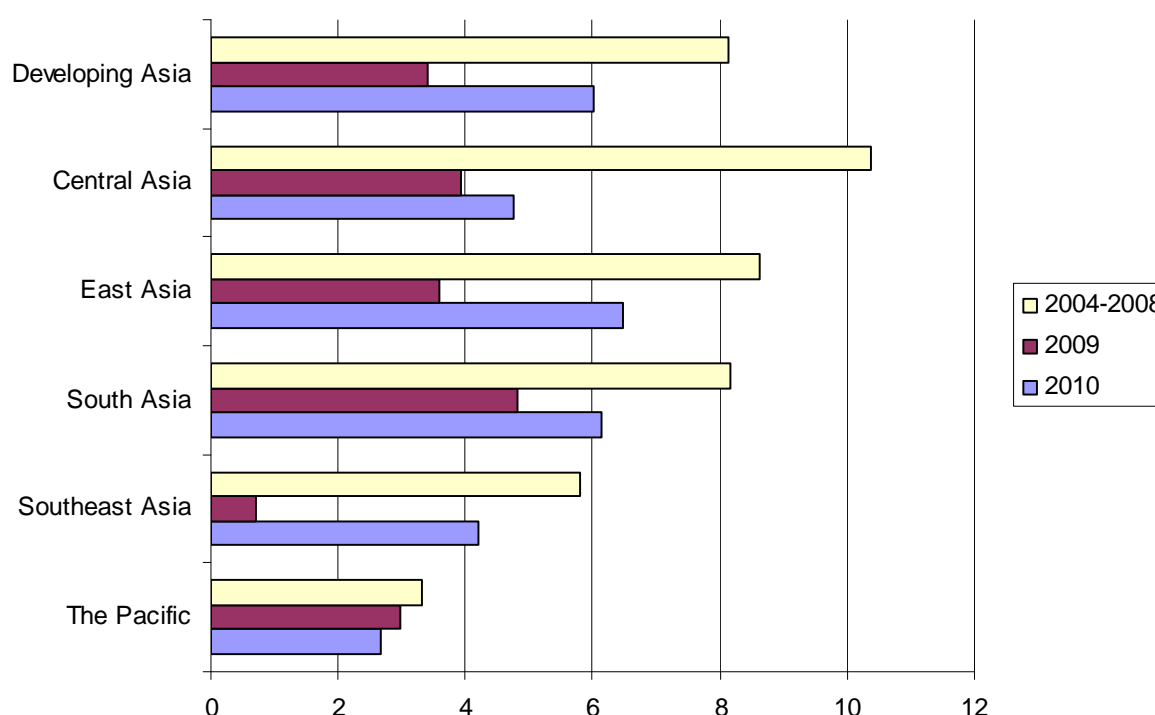
Source: Asian Development Outlook database; staff estimates

Nevertheless, economic growth in developing Asia will remain at a high level compared to other regions in the World. In China (PRC) in particular, real GDP growth should be close to 7% in 2009 and back over 8% in the medium term as it was in the early 2000s. In India, it is anticipated that economic growth will decelerate to 5% for the current year before going up to 7 then 8%. Smaller countries in the region, such as Vietnam or Laos, should also record sustained growth.

Figure 6: GDP annual growth rate, in constant prices
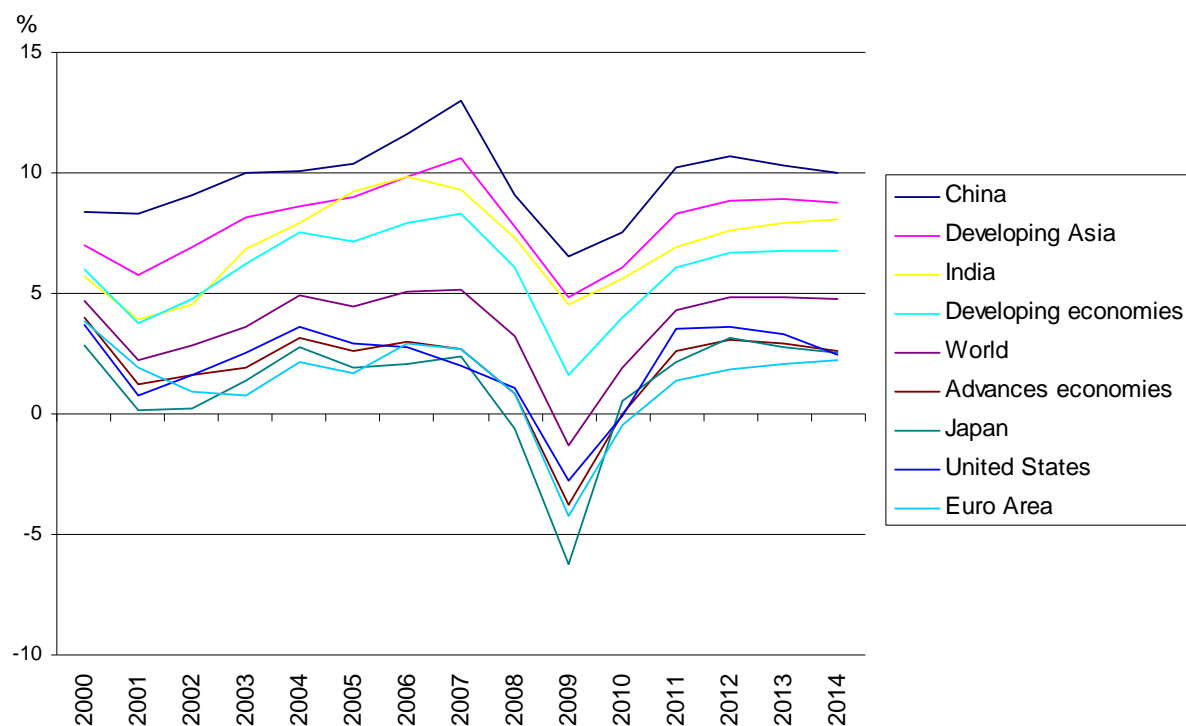
Source: IMF, August 2009

4.2. Preparing for economic recovery, especially in selected key markets

The impact on the region's growth of the current synchronized recession in the advanced economies underlines the risks of excessive dependence on external demand. Export-led growth has delivered enormous benefits to the region and will continue to do so. However, its large and persistent current account surpluses—which emerged only after the Asian crisis—are an integral part of the global imbalances that contributed to the unfolding global financial crisis. Even in the absence of the current financial meltdown, the region may have been paying a heavy price for its output–expenditure imbalance. This price includes not only welfare costs associated with consuming too little, but also opportunity costs arising from failure to use savings productively.

Developing Asia's policy makers have several sets of policy options at their disposal for rebalancing growth toward domestic sources and weaning the region away from excessive dependence on demand in advanced economies. One set is geared toward boosting domestic demand so that domestic consumers and firms can buy more of what the domestic economy produces. Another set aims to alter the structure of output so that it becomes more closely aligned with domestic demand, for example by removing policy distortions that favor manufacturing over services. Yet a third set, pertaining to financial development and adjustment of the exchange rate, can promote a better balance between demand and supply by influencing both components. A fourth set is not domestic in scope, but rather requires greater policy dialogue or coordination, both regionally and globally.

A single policy will have little impact in terms of engendering more balanced growth. Taken together, these policies will make a significant contribution to reducing the region's excessive dependence on external demand.

These policies are of particular importance for the largest 2 emerging economies in the region, China and India. They should also help for recovery in smaller countries, notably in South East Asia:

- after expanding by about 6% for several years, growth in **Indonesia** decelerated in the fourth quarter of 2008 when exports and manufacturing took a hit from the global downturn. GDP growth is forecast to slow this year because of subdued domestic and external demand, before picking up in 2010. Inflation has eased from double-digit rates. Thanks to improved macroeconomic management and a strengthened financial sector, the economy is now in better shape than during the Asian financial crisis. Low levels of public debt, a minimal budget deficit, and its actions to line up external funding support the Government's plans for a fiscal stimulus to bolster the economy.

- **Malaysia** is a trade-sensitive economy and growth came to a virtual halt in the second half of 2008 as the global environment deteriorated. Inflation began to moderate in tandem with slowing growth. With external demand looking bleak, GDP is likely to contract this year, before resuming growth in 2010. The authorities have pushed through fiscal and monetary measures to support domestic demand. In view of the large current account surplus, substantial foreign reserves, and disinflation, the Government has scope to stimulate the economy without endangering macroeconomic stability.

- the **Vietnamese** economy had a turbulent year in 2008. Inflation and the trade deficit surged, and then reversed course. Economic growth slowed and is forecast to moderate further this year, before starting to pick up in 2010. Inflation is projected to be relatively low both years. The current account deficit is expected to widen in 2009 and narrow in 2010. The main near-term challenge is to limit the slowdown in growth while keeping the fiscal and current account deficits in check. In the medium term, the Government needs to ratchet up growth without fuelling inflation or widening the current account deficit.

4.3. Demand for advanced telecom services remain high

Asia Pacific telecom markets prospects remain high. In 2008, regional growth was only 3.3% but this was largely pulled down by the Japanese market, accounting for one third of total in value, which decreased 3.7%. Excluding Japan (APEJ), regional growth was 7.2%, twice faster than worldwide growth (3.7%).

For the current year, APEJ telecom market growth is anticipated to be close to 6% to be compared with 2.6% at world level, and this should accelerate in the medium term with an annual 8% on average for the years 2010 to 2012.(see graph below).

Figure 7: APEJ telecom markets* forecasts, 2008-2013 (billion US$)
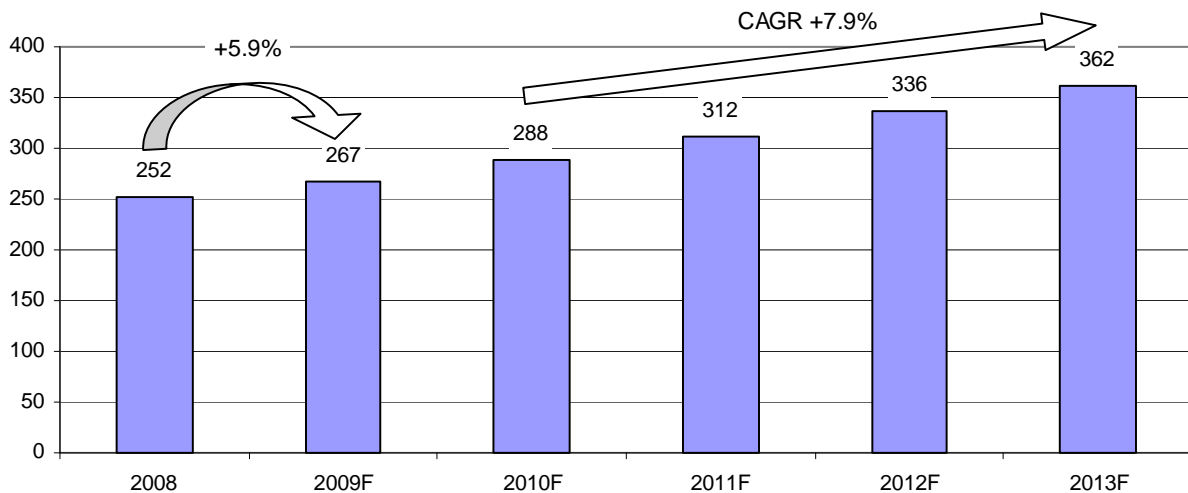
* Telecom markets aggregate revenues from fixed telephony, mobile services and data & internet access

Source: IDATE

The fastest growing segment will be the Internet services, with revenues increasing 28% per year on average until 2013 (x 3.5 within 5 years). Internet share of total telecom revenues should increase from 12% in 2008 to 28% in 2013.

Broadband will be at the heart of this growth with subscriber base growing from 116 millions at the end of 2008 (of which 72 millions in China alone) to 556 at the end of 2013 (x5). In emerging countries, broadband density is still very low; with 5% (5 broadband connections per 100 inhabitants) at the end of 2008, China was one of the most advanced countries in the region and it is anticipated to increase locally to 30% at the end of the period. Same development is awaited for Malaysia; it should also be close to 20% in Vietnam, representing 13.5 million connections. Most developments are based on DSL. FTTx connections will also develop substantially, from 8.3 millions at the end of 2008[2] to 42.5 millions at the end of 2013 (of which 33.3 million FTTH/B connections).

Figure 8: FTTx connections in APEJ countries, 2008-2013 (million)
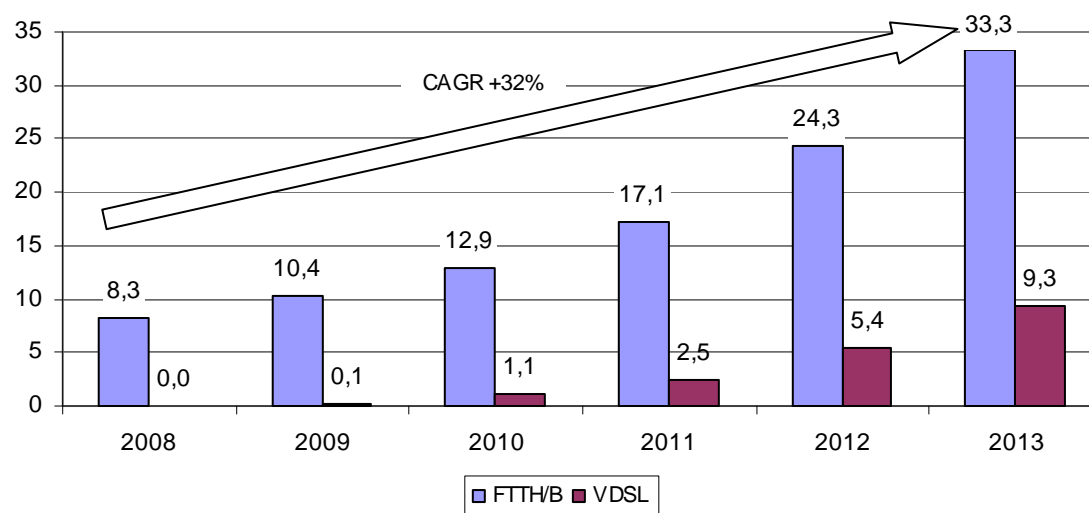
Source: IDATE

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[2] These figures exclude LAN subscribers in China (17 million at the end of 2008)

5. Conclusion: Public initiatives to support FTTH deployments now or never

The global economic downturn produces various effects in the Asia Pacific regions:

- access to foreign capital and export opportunities, which were two driving factors for regional development, are now more limited,
- as anywhere else, local companies aim at making their operations more efficient with reduced operational costs and more targeted investments.

However, economic prospects remain higher than in most other regions of the world and demand for advanced telecom infrastructure and services in particular is still strong as they appear to act as a leverage for economic recovery. In fact, broadband is proving fairly robust in the face of recession. Projections for Japan, China or India remain very close to original forecasts while smaller emerging countries, such as Vietnam, are expected to be relatively unaffected. The sensitivity of network investment to the general economic climate also means that, in downturn periods, these networks are potentially important targets of public investment as a way to increase demand and employment. Even more importantly, telecommunication investment is one of the largest areas of capital expenditure in comparison to other large sectors in the economy.

Thus, at a time when private investors are more cautious than ever, governments should themselves encourage and support large developments. A recent OECD report states that "telecommunication network infrastructure investments are good targets for economic stimulus action for a number of reasons:

i. Some projects can be initiated quickly and require a significant amount of labour which increases employment (shovel ready).

ii. Wired telecommunication investment, by its nature, is a local endeavour providing localised spending and stronger multiplier effects because of reduced leakages.

iii. Extending telecommunication networks to unserved or underserved areas could have stronger marginal impacts on supply and productivity than simply upgrading previously established networks such as electricity, gas, water and transportation."

This is true for advanced economies and for developing regions as well. FTTH deployment programmes have been announced in the Asia Pacific region. The current situation should appeal for governments and/or public institutions to maintain, even to increase, their financial support:

- in Malaysia, 2.4 billion EUR should be spent by Telekom Malaysia and the local government to pass 2.2 million homes in the big cities by 2012,
- in India, the publicly-held operator BSNL plans to implement FTTH networks covering 2 million subscribers in 25 cities by 2012,
- in Australia, 4.7 billion AUD (2.7 billion EUR) should be spent by the local government as initial commitment in NBN
- …

Figure 9: FTTH investment prospects in Asia Pacific

Source: IDATE
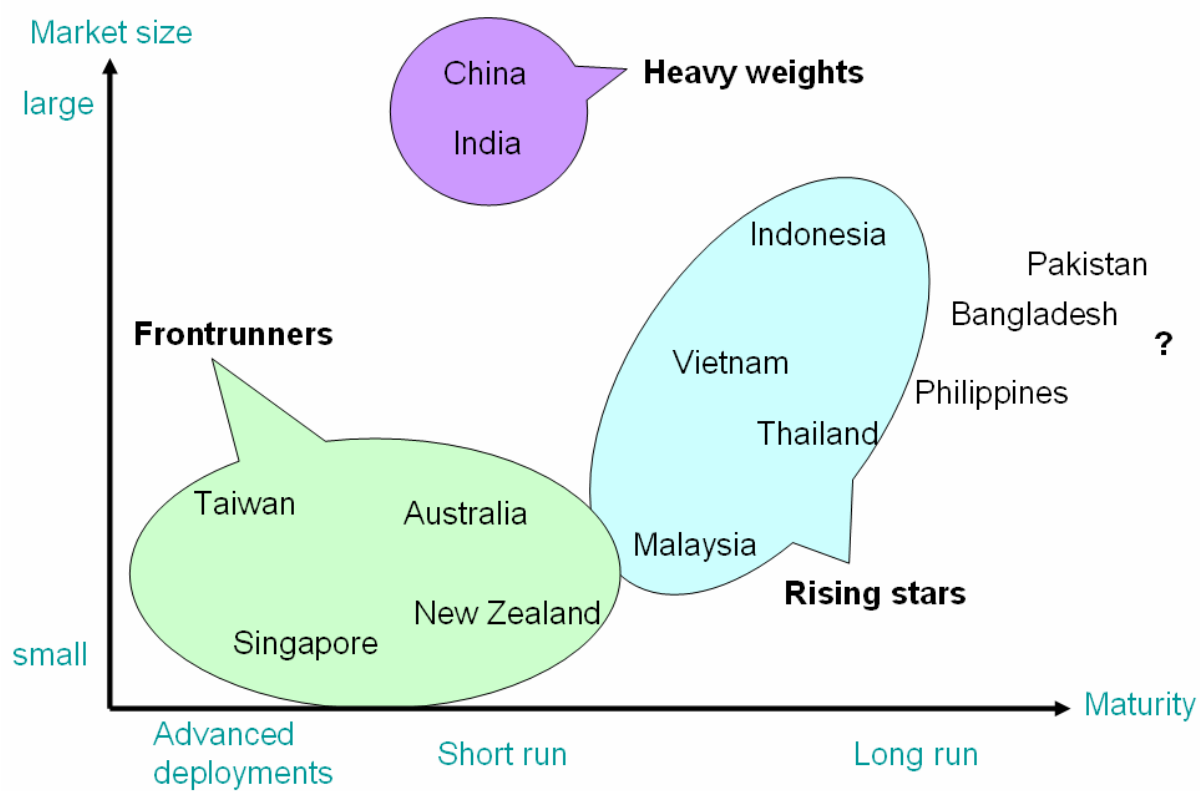
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II - FTTH Business Model

Key findings

For a great many configurations economic constraints continue to be the main obstacles that operators across the board are struggling to overcome.

Thanks to detailed modelling developed by IDATE, we can measure the impact of different options on a FTTH business plan's main cost and income variables, and consolidate these elements to assess the economics of projects as a whole.

Among the conclusions to emerge from these calculations:

- **Location and Density** has a significant influence on investment levels. The lowest cost per FTTH home passed is achieved in very densely populated urban areas,
- **Accessing passive infrastructure:** a 10% increase in civil engineering works for an operator means a roughly 7% to 8% increase in total investment costs,
- **Average number of units per building,**
- **Speed of deployment**: slow progress in coverage makes it possible to spread investments out effectively over time, but also means less income in the beginning,
- **Customer mix**: as with **SAC and customer care costs**, it has no impact on investment costs but only on cash flow.

In this report, based on IDATE Model, we optimised specific costs hypothesis to simulate FTTH Business Cases for 3 cities quite representative of the diversity in APAC region: **Sydney, Hanoi and Taipei.**

Results are quite encouraging for the 3 cases:

- For **Sydney**, simulation show a cumulated Free Cash Flow positive on year 6. Investment per home passed is ranging from 800 to 1 100 AU $ at the end of the period. Quite high density and high ARPU are the main reasons explaining those results.
- For **Hanoi**, simulation show a cumulated Free Cash Flow positive on year 8. Investment per home passed is vey low ranging from 250 to a maximum of 350 US $ at the end of the period. Very high density and low cost of civil Engineering are the main reasons explaining those results.
- For **Taipei**, simulation show a cumulated Free Cash Flow positive also on year 8. Investment per home passed is vey low ranging from 250 to a maximum of 320 US $ at the end of the period. Very high density and a large reuse of existing ducts are the main reasons explaining those results.

1. Introduction

A lot of plans for FTTH & FTTx deployments have been launched or announced in the Asia-Pacific region over the recent past. Japan is now the world leader (in terms of subscribers), with fiber deployments beginning in the 90's and investments intensifying in the early 2000's. More than 90% of the population is today covered by FTTH/B access, putting Japan among the countries with the highest penetration rates. At June 2009, over 50% of broadband internet connections in the country were via FTTH/B.

South Korea was also a pioneer market for very high speed access. Already back in 2003, subscribers began switching gradually from ADSL to VDSL. At June 2009, the country was home to 8.05 million FTTH/B subscribers, out of a total of roughly 15.5 million homes passed: 90% of households in South Korea have access to an FTTH/B offer.

In those countries, the massive development of FTTH/B can be attributed partly to the high population density and concentration in urban areas (81% of the country's population lives in a urban area in South Korea), the large number of high rise apartment buildings and proactive government policies. Complementary reasons (notably competitive pressure over NTT and potential for aerial rollouts) can explain why FTTH/B could develop so strongly in Japan:

Deployments are also well advanced in some smaller countries, such as Hong Kong and Taiwan while large programmes were initiated more recently in other countries of the Asia-Pacific region: China, New Zealand and Australia notably.

In particular, some governments, citing the importance of broadband, have recently invested public funds to address important communication market limitations. These investments fall into two general categories: extending access to unserved/underserved communities and upgrading networks with very high speed lines capable of supporting competitive services in regions and municipalities. Announced government stimulus spending on communication infrastructure will largely target these two types of investment.

However, the central question when talking about FTTH still remains the same: What are the right Business Models to justify FTTH rollouts. On this specific points, APAC region present very diverse economies and territories going from very dense areas as in Japan or Hong Kong to very rural areas like in South East Asia to deserts like in Australia. This paper first present how to build a FTTH Business Model and key associated variables and then proposes study cases in 3 different towns and economies: Sydney (Australia), Taipei (Taiwan) and Hanoi (Viet Nam).

2. Model and simulations

2.1. Model structure

The business model that served as the basis for the simulations and countries study cases in this report is structured around different income and expense items related to the deployment and operation of a FTTH[3] network.

To obtain homogenous elements for comparison, we factored in costs systematically, notably for investments (Capex), for the portion of the network running from the central office to the subscriber premises. Everything that is located upstream from that, i.e. backhaul between the central office and the core network, was excluded from our model even if, in some configurations and for certain types of player, work also needs to be done on that section of the network.

The various items taken into account are summarised in the following table.

Figure 10: The model's overall structure
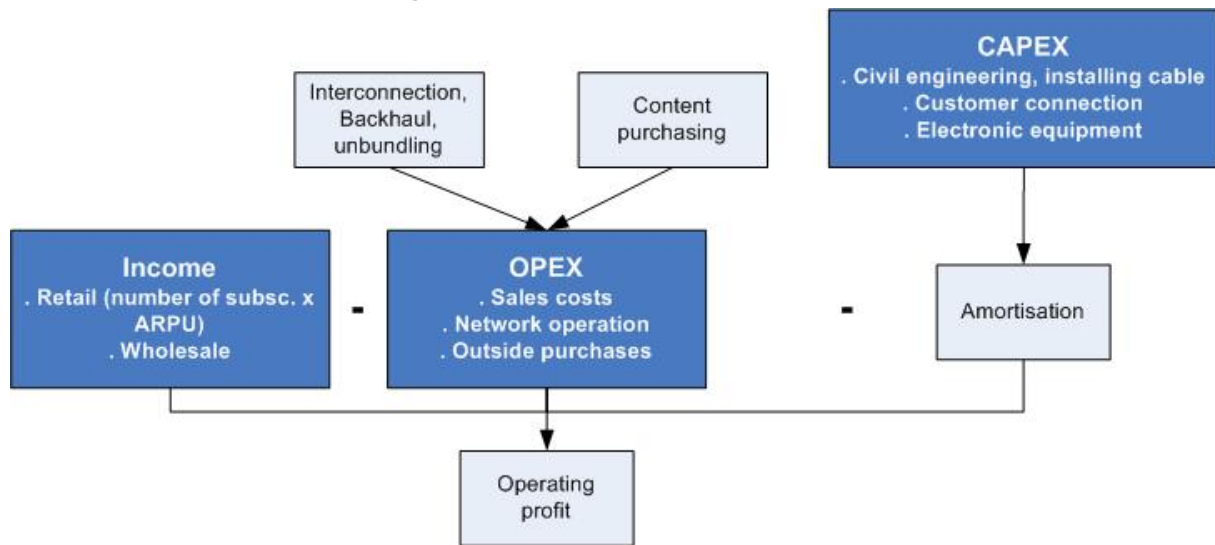
Source: IDATE

Items under the heading of **"income"** include both retail revenue, derived from billing customers for access and services – which we have calculated based on ARPU (average revenue per user) hypotheses – and, when applicable, wholesale market income – as is the case with providers of wholesale unbundled access and for companies that rent passive infrastructure to third party operators.

Items that fall under the heading of "**expenses**", referring here to operating expenses (Opex) encompass commercial costs, including subscriber acquisition costs or SAC (advertising, direct marketing, promotions, etc.) and spending on customer accounting management (billing, collection). Also included are the networks' technical operating costs, in other words those generated by the operation and maintenance of the equipment dedicated to providing FTTH access and related services.

External purchases include the cost of leasing the lines/links needed to create an access network – which can include rights of way or existing ducts for laying cable as well as backhaul links or last mile connection – and possibly content acquisitions (chiefly TV programmes).

Amortisation is calculated based on the sum of the different investments made in building the network, spread out over time, with specific amortisation periods established for each category.

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[3] Following some adaptations, FTTB as well as FTTN+VDSL Business Models can also run using this IDATE's tool.

Items under the "investments" heading therefore serve indirectly (through amortisation) to calculate operating balances, but naturally have an intrinsic value given the sums involved in a number of the configurations selected, and the impact they have on operators' cash flow and/or debt level. Different sensitivity measurements have been made directly on these items which are broken down systematically into: investments in passive infrastructure (civil engineering, manholes, passive equipment, including cable) and investments in active equipment (optoelectronic equipment, including terminals).

2.2. Model parameters

2.2.1. Technical configurations

In our model we have selected two FTTH technologies: GPON and Ethernet P2P (E-P2P). EPON technology can be also studied using our model but it is not presented in this report.

We devoted our efforts here to three distinct FTTH architectures configurations that correspond to the most common configurations found in rollout projects today: one is based on a two-splitter (8x8) shared solution (GPON), the second a shared solution (GPON) with a single splitter (x 32) and the third based on a point-to-point solution (E-P2P).

Figure 11: Two-level GPON technology
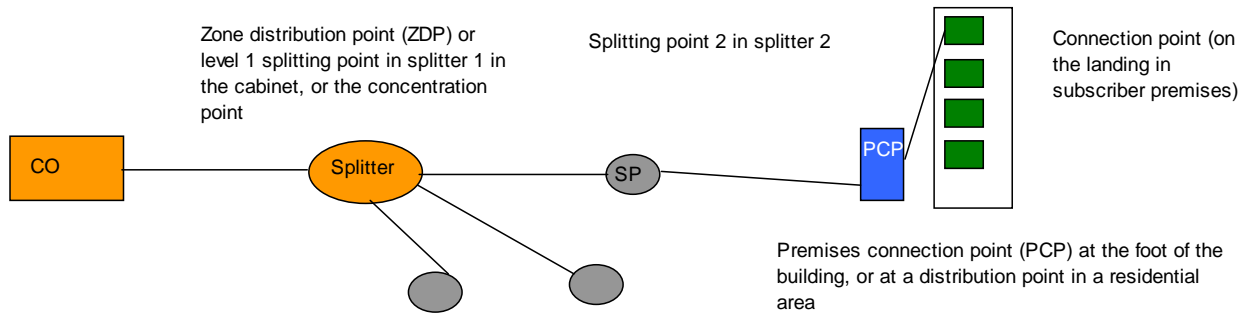
Source: IDATE

Figure 12: Single level GPON
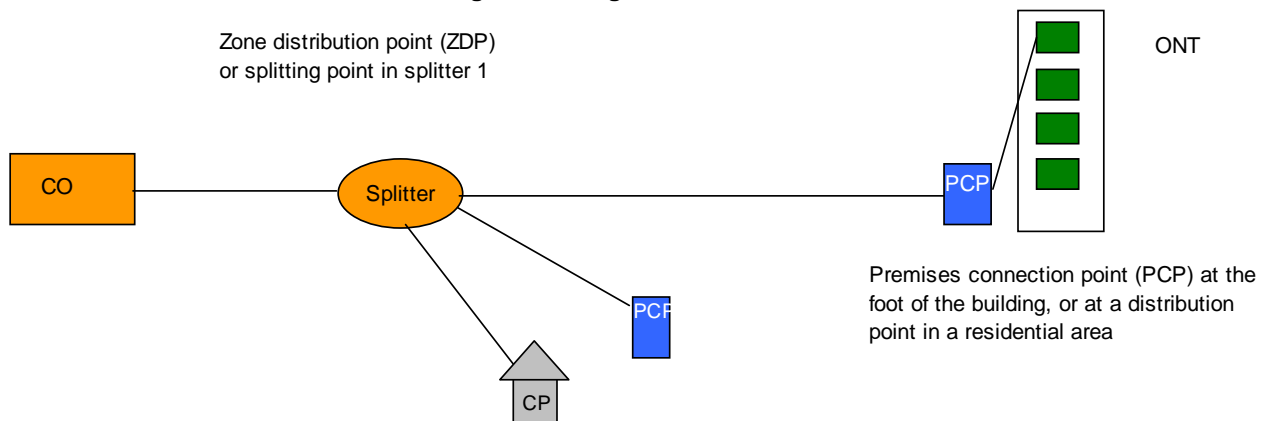
Source: IDATE

Figure 13: Ethernet point-to-point (P2P)
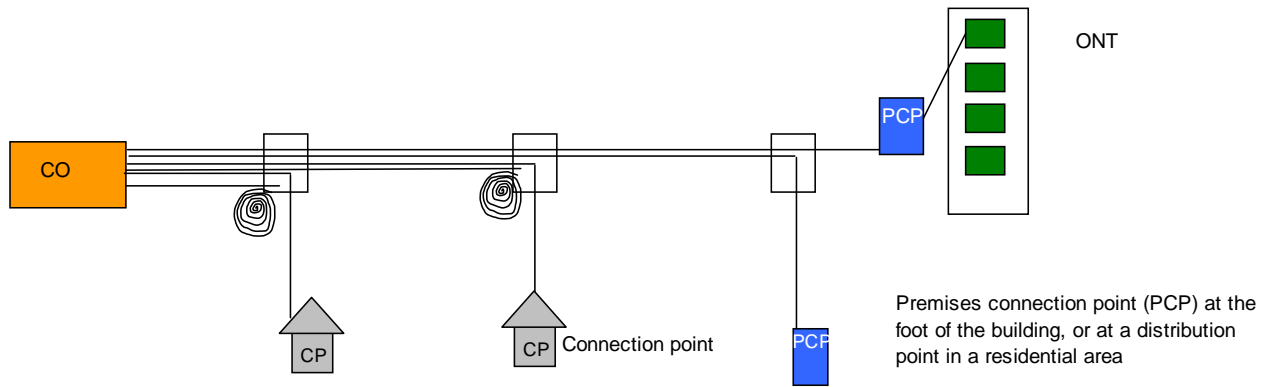
Source: IDATE

2.2.2. Choice of seven different zones

We have chosen seven different types of residential zone to ensure that our model can cover a sizeable portion of possible case scenarios in the field.

- These include three types of **urban** zone. The first corresponds to a large metropolitan area such as Paris, the second to a less densely populated metropolitan area, such as London or Amsterdam, and the third to cities such as we find in Germany, e.g. Frankfurt and Stuttgart where the population density is around 2,500/km². Equivalent cities can be found in Asia Pacific at the difference of course of huge cities that can be found at a capital level or in China and India.

- Two types of **suburban** zone: one where residences are chiefly multiple dwelling units (blocks of flats) and residential areas with detached and semi-detached houses.

- And, finally, two types of **rural** zone have been included to assess the viability of an FTTH rollout in sparsely populated areas. A concentrated rural population has a density of 1,000/km², or twice that of a sparsely populated area. It should be specified that the densities applied to rural zones correspond to established population concentrations. Taken together, the population density in rural areas is systematically below 100/km².

To be able to compare the zones, we have scaled them such that each one has one million eligible customer units. Depending on the type of zone, these units include a different mix of households and businesses.

Figure 14: The seven zones of the simulation and their features

Type of zone	Highly concentrated urban	Wide area concentrated urban	Medium-density urban	High-rise suburban	Residential suburban	Concentrated rural	Wide area rural
Average population density (per km²)	20 000	5 000	2 500	5 000	2 500	1 000	500
Type of housing	MDU	MDU	MDU	MDU	Single family	Single family	Single family
Average number of people per household	2.2	2.2	2.2	2.8	2.8	2.5	2.5
Average number of enterprises per 100 households	20	20	15	10	10	5	3
Number of eligible units	1 million	1 million	1 million	1 million	1 million	1 million	1 million
Number of households	833 333	833 333	869 565	909 091	909 091	952 381	970 874
Number of enterprises	166 667	166 667	130 435	90 909	90 909	47 619	29 126
Population (inhabitants)	1 833 333	1 833 333	1 913 043	2 545 455	2 545 455	2 380 952	2 427 184
Surface area of inhabited zones (in km²)	92	367	765	509	1 018	2 381	4 854
Average number of housing units per building	8	6	6	15	1	1	1
Central office's average capacity (lines)	30 000	15 000	10 000	7 500	2 500	1 000	500
Cabinet's average capacity (lines)	457	457	457	309	309	122	122

Source: IDATE

In our model, we have hypothesised that a portion of connection costs in single family dwellings (civil engineering from the curb to the ONT) is paid for by the customer. There are additional costs involved in multiple dwelling units as operators cover the entire cost of connection (from the riser and the curb to the ONT). And, finally, the average capacity of the splitter is the weighted average of the calculated capacity for the urban, suburban and rural zones in Europe's five largest countries.

2.2.3. Other criteria factored into the model

Technical configurations have a very direct influence on investments. The cost of each equipment item was established based on information gathered from manufacturers, operators and civil engineering firms. The different costs that were factored in are listed in a specific table (not listed here). Please notice that those costs here listed have been determined first for a typical developed country. Of course, as we will detailed it later, all those cost have been adapted to the 3 study cases here proposed for the APAC region.

As concerns the electronic equipment, a measure of technical progress has been applied year after year, which varies depending on the current level of maturity of the technology in question – e.g. 12% a year for GPON equipment and 5% a year for Ethernet equipment.

Amortisation of the network itself and of the edge equipment is achieved in a linear fashion over the estimated lifespan of each element, namely:

- civil engineering: 40 years,
- fibre: 20 years,
- racks, air conditioning equipment: 10 years,
- electronic equipment: 5 years.

For the other items in the "**expenses**" category, commercial costs are broken down between subscriber acquisition costs (SAC) and customer care costs. Subscriber acquisition costs naturally vary depending on the type of marketing used: either individual "door-to-door" or broad campaigns (vast promotional campaigns, automatic transfer of existing customers when a zone is equipped with ultra-fast access).

Acquisition costs will also be higher when the churn (customer loss) rate is high since, to maintain its client base levels, an operator will need to compensate for its cancelled subscriptions with the same gross number of sales.

Technical operations costs, including maintenance fees, were measured as a percentage of the investment in the corresponding equipment. This percentage varies depending on the technology deployed:

- on a copper access network, it can be estimated at 10% (for reasons of proximity, we can apply this ratio to VDSL architectures for instance);
- on a FTTH network, it would be between 7% and 8%: 7% for GPON technologies that require less air conditioning and maintenance, and 8% for Ethernet P2P technologies.

External purchases are measured as a percentage of retail revenue, the logic being that a high ARPU helps to pay for a content-rich offer. We have thus set two rates, each corresponding to a different level of ARPU. This first set of hypotheses, which corresponds to offers with more or less added value, differs with respect to spending on content for residential customers (TV packages, VoD, catch-up TV) and the additional services for businesses (QoS, VoIP, security).

In the first case, the hypothesis is that most of the accessible content is either free or ad-funded, and that operators' outlay to content providers is limited. In practice, external purchases which – aside from the content acquisitions referred to above – cover the cost of IP interconnectivity and call termination fees, are estimated to account for 30% of ARPU in the first case.

In the second case, content and value-added services incur additional costs that need to be covered by a higher rate of payback. Here, we estimate that external purchases account for 70% of the additional ARPU generated by these services.

Revenue has been assessed based on two levels of ARPU. Our simulations include an ARPU of 40 EUR/month, with a distinction made between residential and business subscribers at the VAT level: 40 EUR including VAT for residential customers and 40 EUR excl. VAT for enterprises, placing ultra high-speed access as an extension of broadband, with similar applications and improved convenience.

We have also introduced another level of ARPU of 80 EUR/month for an ultra high-speed solution enhanced with new applications, notably content for residential customers (TV packages, VOD, catch-up TV) and services for businesses (QoS, VoIP, security). This new level of ARPU, referred to as VAS ARPU, includes the same VAT-related distinction between residential and business customers.

2.2.4. Increasingly complex realities

The process of establishing different economic simulations for FTTH network rollouts naturally takes account of a number of income and expense hypotheses. As detailed below, the scenarios considered enabled us to set hypotheses that deal more specifically with rollout conditions.

We were thus required to set a certain number of fixed parameters whose variations could nevertheless have a considerable, and even a significant impact on operators' business plans.

Among them, we should mention:

- **The existing broadband customer base**

    It goes without saying that an operator that already has a sizeable broadband customer base will have an easier time switching it to FTTH, especially if the price charged for the faster service is comparable to the price of the current broadband service. This therefore gives that operator an immediate advantage in terms of penetration, and will mean lower commercial costs.

- **The development of bandwidth-hungry applications, especially HDTV**

    As it stands, very high-speed services are hard to distinguish from existing broadband services, which is why the prices charged are almost identical in a great many cases. But changing customer demands and consumption patterns could help spur the development of solutions that will require the bandwidth that only an FTTH network can supply. The emphasis here is often on HDTV and video services. Aside from increased demand for bitrates, the development of HDTV could itself help spur the deployment of optical fibre networks. Once high definition becomes the norm in TV viewing, optical fibre could quickly become the most compatible reception mode, especially in apartment buildings, and thus more ubiquitous.

- **Shared indoor installations**

    This is a still very pertinent issue for all of the players involved in FTTH access rollouts. For operators it means being able to serve users in apartment buildings without having to deploy their own indoor network. For property owners and developers, it means reducing the work done in the building without having to confine themselves to single service provider. In some countries, most notably in Northern Europe or South Korea, a number of property developers/managers are involved directly in FTTH rollouts by installing the passive optical fibre infrastructure inside their buildings, and contracting a carriers' carrier to operate the neutral and open access network.

- **Network configuration**

    We have selected and compared three basic technical configurations, but there are far more numerous possibilities for both technologies and network architectures. Excluding FTTH, with an FTTx network the fibre can be pulled to a number of different points, either to the curb (FTTC) or to the building (FTTB): the technology used in the last mile can be either VDSL over the copper pair or Ethernet. There are a number of PON technologies (BPON, EPON…), each one with its own set of technical particularities. And of course the network topology can vary from case to case: tree, ring, star.

- **Closing central offices**

    An FTTH rollout can be achieved with a limited number of concentration points, thanks to NGA technologies' very long range. Wavelength multiplexing possibilities make it possible to further increase the networks' capacities. For incumbent carriers this means that, when deploying FTTH infrastructure, they can generate substantial savings by by-passing a sizeable portion of existing central offices (sale of properties when they own the building, and savings on operations when they are only tenants). These configurations must nevertheless offer satisfactory replacement solutions to alternative operators whose networks are often connected to the incumbent's local loop at the central office (notably: DSLAMs in the exchange for ADSL unbundling).

2.3. Simulations for each of the zones

2.3.1.   Hypotheses common to all the zones

For the purposes of our model simulations we have set a number of features that are common to each zone, to make it easier to compare the results.

The common features are:

- the **number of eligible customer units** in each zone: 1 million units composed of 870,000 households and 130,000 enterprises for a total population of 1.91 million inhabitants;

- the operator deploying the network is an **incumbent carrier**. Its existing network enables it to generate a savings of 70% on the civil engineering costs needed to install cables (trenches, ducts, manholes, etc.);

- the network's **rate of deployment** makes it possible to achieve 100% coverage within 5 years, at a pace of 20% of the population per year;

- the **relative penetration** (number of subscribers divided by number of homes passed) is 30% in 2008 and increases in a linear fashion to 50 % in 2017;

- 30% of customers generate value-added **ARPU** (66.90 EUR excl. VAT a month for residential customers and 80 EUR excl. VAT a month for business customers), with the remaining 70% having a basic ARPU (33.40 EUR excl. VAT a month for residential customers and 40 EUR excl. VAT a month for business customers);

- the **average annual churn rate** is 15%;

- **subscriber acquisition costs** (excluding CPE) total 80 EUR per new subscriber, and **general costs** total 60 EUR a year per subscriber;

- and, lastly, for FTTH E-P2P, outbound cables from the central office go through the cabinet before reaching the building cabinet or the ONT.

2.3.2. Analysis of the results

The following graph helps underscore the variations in per-subscriber investment levels by zone and by FTTH technology.

Figure 15: Variation in the average per-subscriber investment by type of zone, for a relative penetration rate of 30%

(EUR per subscriber)
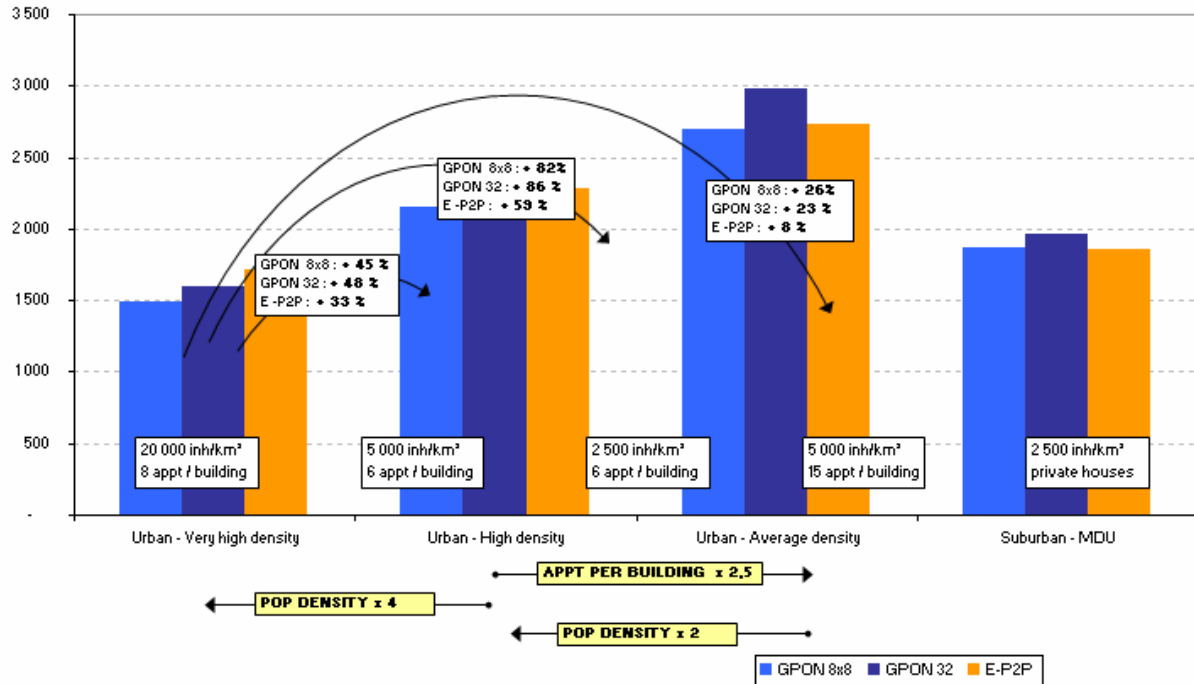
Source: IDATE

In this graph, it is important to remember to note that:

- Ethernet P2P, appears to be more costly than GPON technologies in highly concentrated zones;
- in all cases, GPON architecture with two times 8x8 splits is less costly than GPON 32 with one level of splitter for which the price per subscriber is 17% higher, on average;
- taking a highly concentrated urban zone as the benchmark, with a GPON 8x8 configuration, the average investment per subscriber is:
    - 26% higher for a population density that is four times lower, and a concentration of housing units per building that is 150% higher, in suburban high-rise zones;
    - 45% higher for a population density that is four times lower, and a concentration of housing units per building that is 25% lower, in wide area concentrated urban zones;
    - 82% higher for a population density that is eight times lower, and a concentration of housing units per building that is 25% lower, in medium-density urban zones.

3. Countries Study Cases

In this chapter, we have adapted our model presented previously to run **3 real study cases** being towns in **3 different economies** quite representative of the APAC Region: **Sydney** in Australia, **Hanoi** in Viet Nam and **Taipei** in Taiwan.

Indeed we have adapted in particular all characteristics of the territories like:
- Population density,
- Percentage of homes in MDU vs SDU
- Cost of civil engineering in Urban and Suburban areas,
- ARPU for FTTH vs current ARPU for Broadband, TV or Triple Play.
- ….

3.1. Sydney Simulation

First input has been regarding the demographic context for Sydney:
- population: 3 645 153 inhabitants,
- Density: 2 058 inhabitants / Km²,
- 1.4 million Households,

The city is also characterised by a predominance of horizontal habitat and very little vertical habitat in urban areas. There's also a very low proportion of high rise building.

We can consider 3 main types of habitat:
- Flats / purposed built: 28%,
- Semi-detached / Terrace house: 12.3%,
- Separate house: 58.7%.

Concerning main hypothesis of the model, we have taken the following structural assumptions:
- Hardware equipment cost is based on Western Europe costs (as detailed before) and all converted to AU$,
- ARPU is assumed in line with current broadband packages + TV offer available today in Australia and that's pretty high compared to Europe for instance: 160 AU$,
- Deployment is assumed to be achieved quite quickly in Sydney: 25% of homes coverage per year,
- Penetration on coverage is assumed at 15% in year 1 with +8% per year thereafter
- Amortisation of Civil Engineering (as detailed above): 40 years,
- Finally we have also considered that existing ducts owned by Telstra or the City of Sydney will be largely re-used on 80% of the deployment. The rate of renting taken is AU$2 per meter for those existing ducts.

Figure 16: FTTH (GPON) equipment costs hypothesis for Sydney case

(AU$)

passive equipment :	$
Surveys (average/metre)	6.0
civil engineering (price per metre, underground) :	
Metro & urban areas	70.0
suburban areas	50.0
rural areas	50.0
access chamber (price per metre of cable path) :	
Metro & urban areas	20.0
suburban areas	7.0
rural areas	5.0

	$
renting duct	2.0
Optical cable 1 pair OF	0.8
Optical cable 12 pair OF	0.9
Optical cable 24 pair OF	1.9
Optical cable 144 pairs	1.9
cable laying	2.5
main equip room + air con. (per CO)	94500.0
connections + jumpings (price per OF out)	72.0
splitter (price per OF out)	43.0
splice	9.3
Building riser (for a 20 dwellings building)	220.0

Connection (per plug) :	$
surveys	35.0
OLT (2048 clients capacity)	5715.0
card GPON	8492.0
connection :	
for multi dwelling building	215.0
for individual dwelling (surface duct)	382.0
for individual dwelling undergound (for 10 m)	215.0
ONT	259.0

Source: IDATE

Here after we can present key results of the model running with hypothesis taken for Sydney on a FTTH – GPON architecture in terms of:

- Free cash flow per year on a brown field scenario (excluding taxes),
- Cumulated free cash flow on a brown field scenario (excluding taxes),
- Investment per home passed on a brown field scenario

Figure 17: Free cash flow per year scenario brown field (excl. tax, AU$ million)
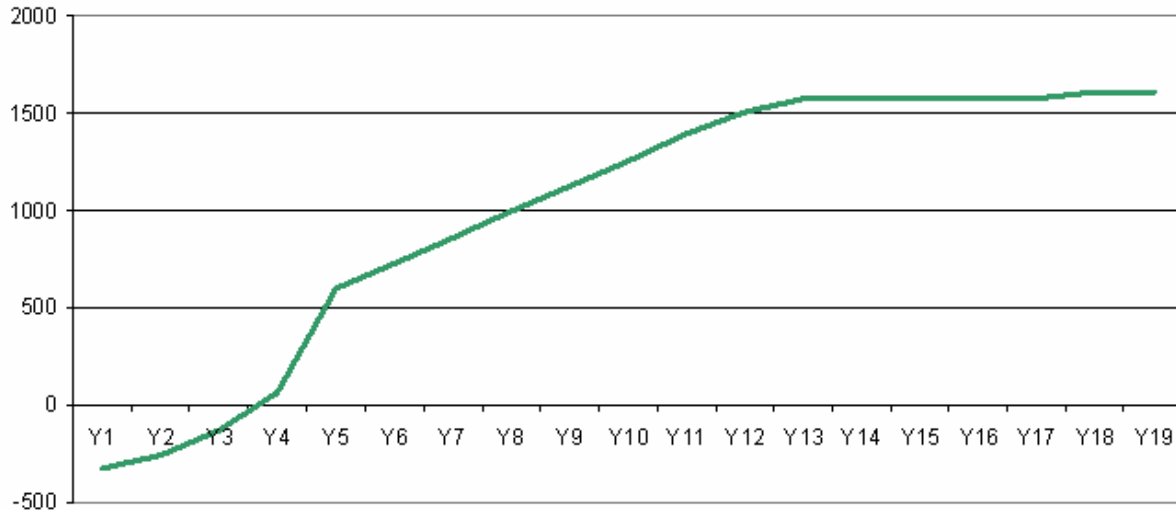
Source: IDATE

Figure 18: Cumulated Free cash flow scenario brown field (excl. tax, AU$ million)
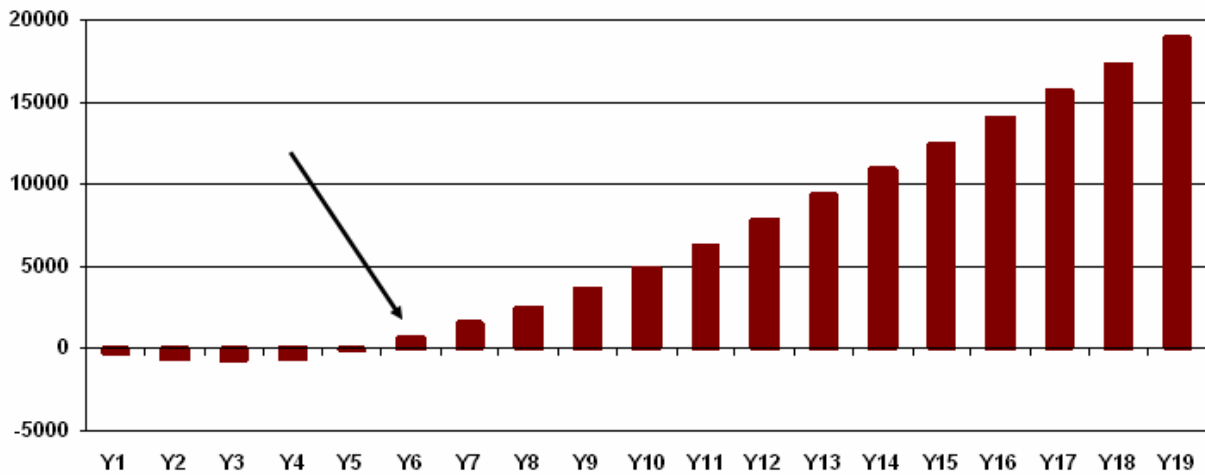
Source: IDATE

Figure 19: Investment (including CPE) / Home passed scenario brown field (AU $)
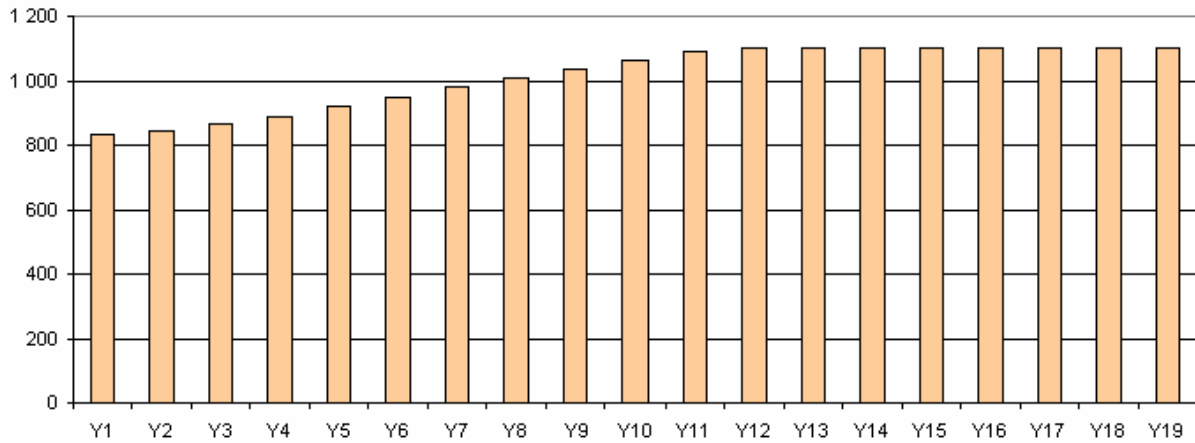
Source: IDATE

Results for Sydney case are quite encouraging: quite high density and high ARPU are the main reasons explaining those results.

Indeed, simulations for Sydney, taking specific hypothesis show a cumulated Free Cash Flow positive on year 6. Investment per home passed is ranging from 800 to 1 100 AU $ at the end of the period.

3.2. Hanoi Simulation

First input has been regarding the demographic context for Hanoi:

- population: 3.4 Million inhabitants,
- Density is very high: up to 35 000 inhabitants / Km²

Figure 20: Densities in Hanoi Districts

Provincial Cities/Districts	Wards	Area (km²)	Population	density / km²
Đống Đa	21	9.96	352,000	35341
Hoàn Kiếm (Sword Recurrent)	18	5.29	178,073	33662
Hai Bà Trưng	20	14.6	378,000	25890
Ba Đình (Three Temples)	14	9.224	228,352	24756
Thanh Xuân (Green Spring/Youth)	11	9.11	185,000	20307
Cầu Giấy (Paper Bridge)	8	12.04	147,000	12209
Hoàng Mai (YellowPlum)	14	41.04	216,277	5270
Tây Hồ (West Lake)	8	24	115,163	4798
Hà Đông (East Bank of the River)	17	47.917	198,687	4146
Long Biên (Dragon Fin)	14	60.38	170,706	2827
Sơn Tây (West of the Mountain)	15	113.474	181,831	1602

Source: National Statistics

The city is also characterised by a combination of some high rise buildings with a dominant proportion of individual houses.

Figure 21: View from Hanoi

Some new boroughs of Hanoi are well suited for NGA with high rise buildings and new buildings with ease of rising columns.

Figure 22: New boroughs in Hanoi

As for the Sydney cases, we have adapted here infrastructure costs taking in particular a low cost for Civil Engineering.

Table 1: FTTH (GPON) equipment costs hypothesis for Hanoi case

(US $)

passive equipment :	$
Surveys (average/metre)	6.0
civil engineering (price per metre, underground) :	
Metro & urban areas	15.0
suburban areas	12.0
rural areas	10.0
access chamber (price per metre of cable path) :	
Metro & urban areas	10.0
suburban areas	7.0
rural areas	5.0
renting duct	0.5
Optical cable 1 pair OF	0.8
Optical cable 12 pair OF	0.9
Optical cable 24 pair OF	1.9
Optical cable 144 pairs	1.9
cable laying	0.8
main equip room + air con. (per CO)	70000.0
connections + jumpings (price per OF out)	72.0
splitter (price per OF out)	43.0
splice	9.3
Building riser (for a 20 dwellings building)	70.0

Connection (per plug) :	$
surveys	17.0
OLT (2048 clients capacity)	5715.0
card GPON	8492.0
connection :	
for multi dwelling building	70.0
for individual dwelling (surface duct)	90.0
for individual dwelling undergound (for 10 m)	70.0
ONT	75.0

Source: IDATE

Here after we can present key results of the model running with hypothesis taken for Hanoi on a FTTH – GPON architecture in terms of:

- Free cash flow per year on a brown field scenario (excluding taxes),
- Cumulated free cash flow on a brown field scenario (excluding taxes),
- Investment per home passed on a brown field scenario

Figure 23: Free cash flow per year scenario brown field (excl. tax, US $ million)
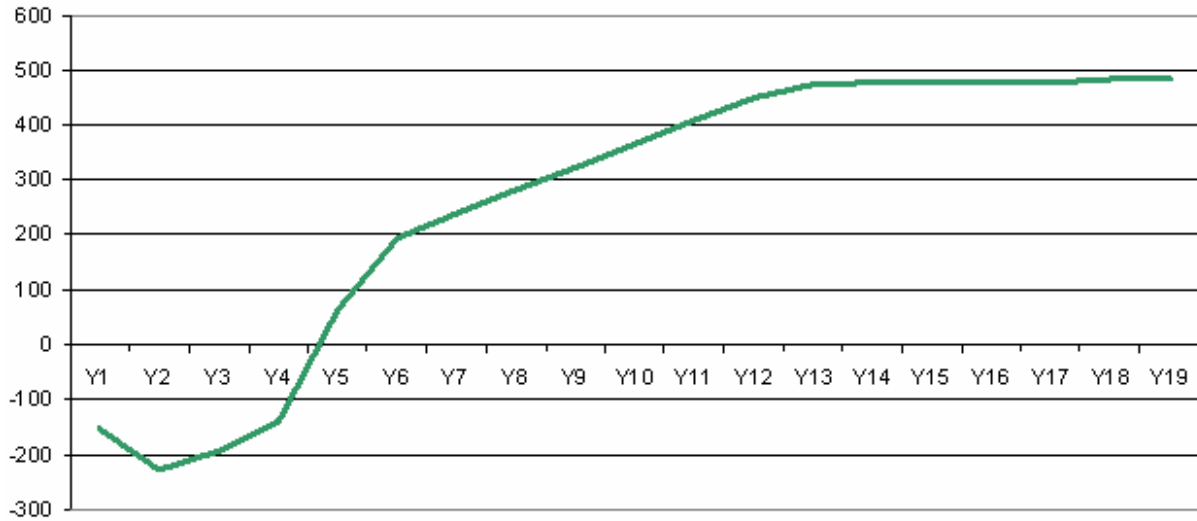
Source: IDATE

Figure 24: Cumulated Free cash flow scenario brown field (excl. tax, US $ million)
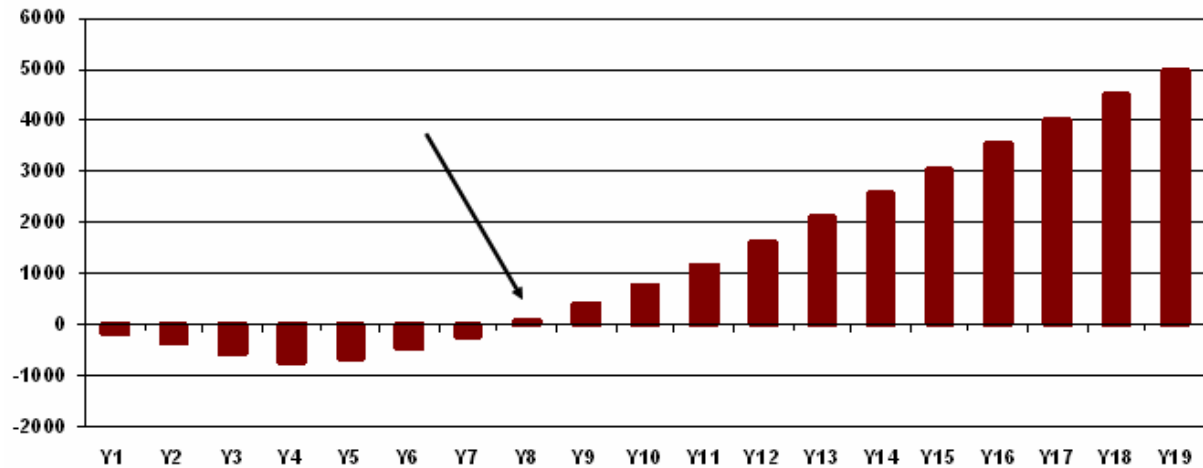
Source: IDATE

Figure 25: Investment (including CPE) / Home passed scenario brown field (US $)
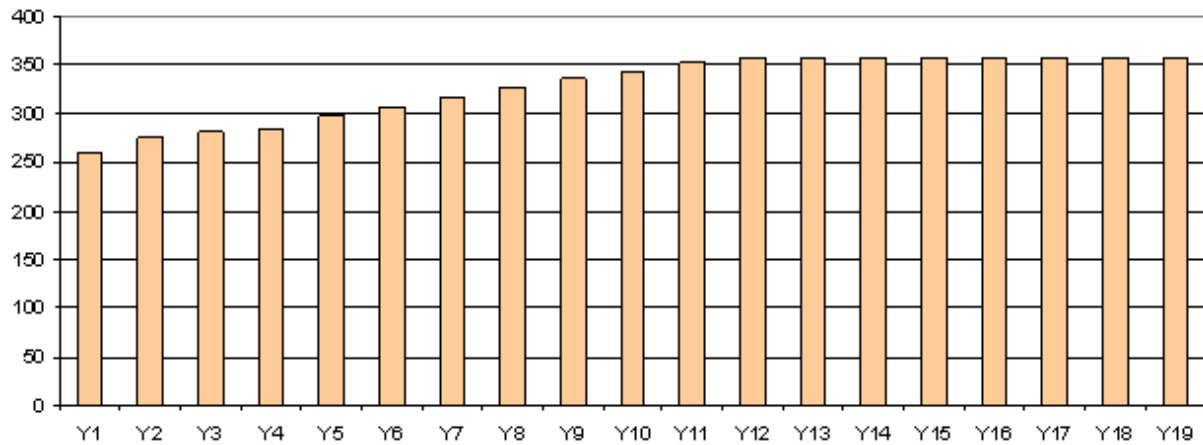
Source: IDATE

Results for Hanoi case are also quite encouraging: very high density and low cost of civil Engineering are the main reasons explaining those results.

Indeed, simulations for Hanoi, taking specific hypothesis show a cumulated Free Cash Flow positive on year 8. Investment per home passed is vey low ranging from 250 to a maximum of 350 US $ at the end of the period.

3.3. Taipei Simulation

First input has been regarding the demographic context for Taipei:

- Average density on the island is 633 h/ km²
- Taipei population density is dense 9 639 h / km² and 3591 households / km²

Figure 26: View from Taipei

The city is also characterised by a well connected population:

- 7.1 m broadband connections at end of 2008, 30.9% broadband penetration and 66% internet penetration (68% of internet connection are broadband)
- FTTH/B is well under way in Taiwan with a forecast of 83% network coverage by Chunghwa by 2013. In June 2009, Taiwan counts 1.34 million FTTH/B subscribers.

Competition between technologies is dynamic in Taiwan with predominance of DSL but also arrival of WiMAX:

- WiMAX is offered in Central Taiwan by Far EasTone by end of 2009,
- Several operators plan to launch WiMAX offers (Global Mobile, Vee Telecom).

Taipei City government plans to establish a fiber-optic network for FTTx along the city's sewer conduits.The sewer system in Taipei consists of underground conduits with a total length of about 800km.The project undertaker should make complete investment to set up the fiber-optic network and then operate FTTx business for 20 years.

Upon the expiration of the franchised operating period, all equipment and facilities should be returned to the city government without any compensation. The project undertaker will be required to pay an annual franchise fee based on a certain percentage of FTTx operating revenues for that year plus sewer conduit rent at a rate of NT$1 per meter monthly.

Figure 27: Densities of Taipei districts
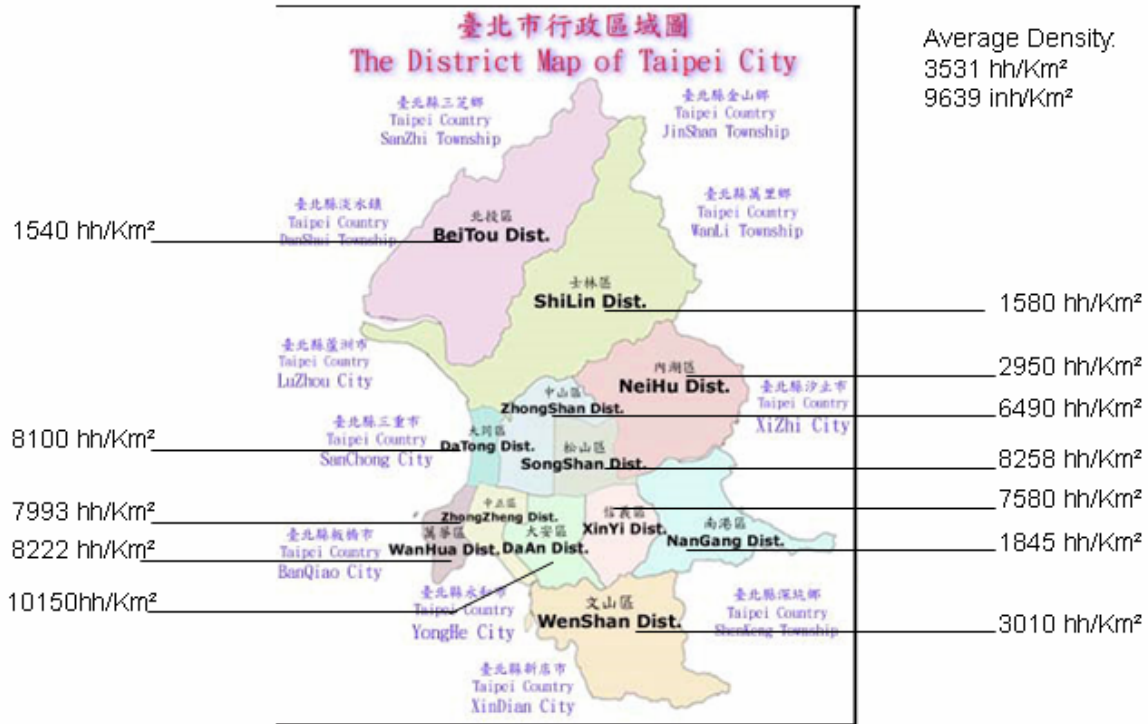
Source: National Statistics

The following table gives main assumption taken for Taipei simulation.

Deployment coverage	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Metro	25%	50%	75%	100%	100%	100%	100%
Urban	0%	25%	50%	75%	100%	100%	100%
Suburban	0%	0%	0%	0%	0%	0%	0%
Rural	0%	0%	0%	0%	0%	0%	0%
Average	14%	39%	64%	89%	100%	100%	100%

ARPU consumer (3X play)	$34	$34	$34	$34	$34	$34	$34

Penetration rate

hypothesis penetration/coverage	15.0%	23.0%	31.0%	39.0%	47.0%	55.0%	63.0%
Metro	4%	12%	23%	39%	47%	55%	63%
Urban	0%	6%	16%	29%	47%	55%	63%
Suburban	0%	0%	0%	0%	0%	0%	0%
Rural	0%	0%	0%	0%	0%	0%	0%
Average	2%	9%	20%	35%	47%	55%	63%

Other important assumptions are:
- very low rent in existing ducts (10cts/meter),
- high percentage (80%) of reuse of existing ducts
- Metro density: 8 059 (Songsham, Xinyi, Daan, Zongsham, Zhongzheng, Datong, Wanhua districts)
- Urban density: 2 030 (districts of Wanhua, Wenshan, Nangang, Neihu, Shilin, Beitou)

Here after we can present key results of the model running with hypothesis taken for Taipei on a FTTH – GPON architecture in terms of:
- Free cash flow per year on a brown field scenario (excluding taxes),
- Cumulated free cash flow on a brown field scenario (excluding taxes),
- Investment per home passed on a brown field scenario

Figure 28: Free cash flow per year scenario brown field (excl. tax, US $ million)
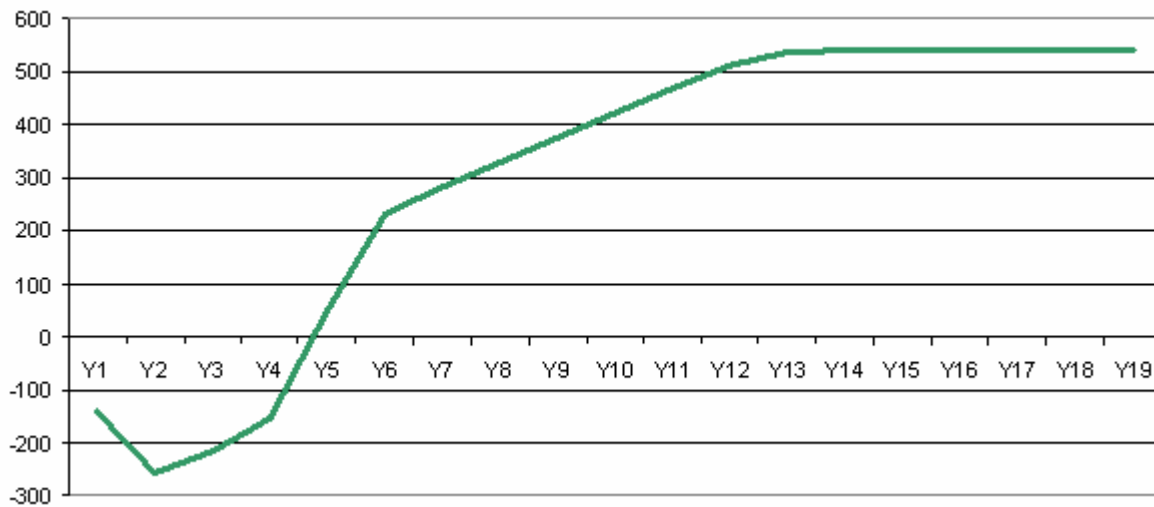
Source: IDATE

Figure 29: Cumulated Free cash flow scenario brown field (excl. tax, US $ million)
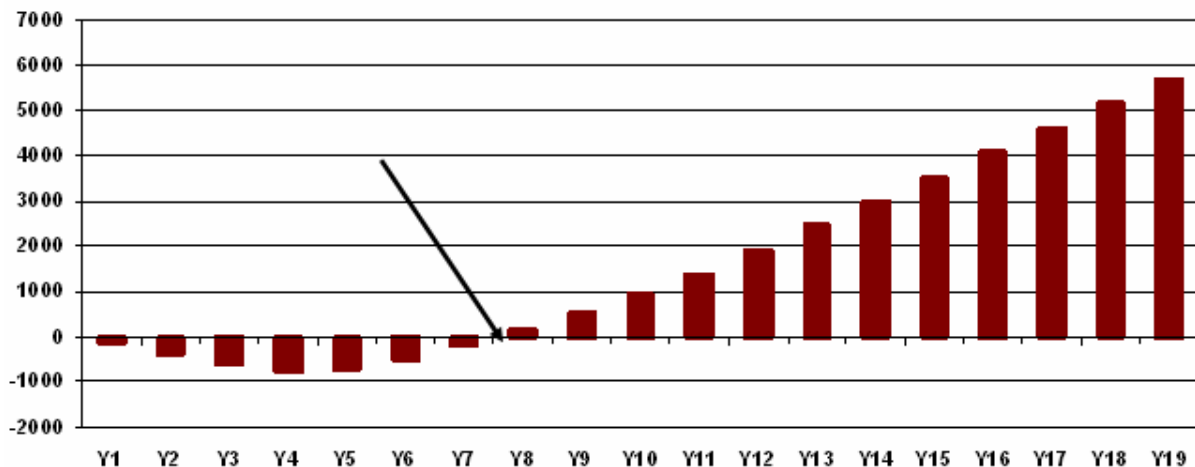
Source: IDATE

Figure 30: Investment (including CPE) / Home passed scenario brown field (US $)
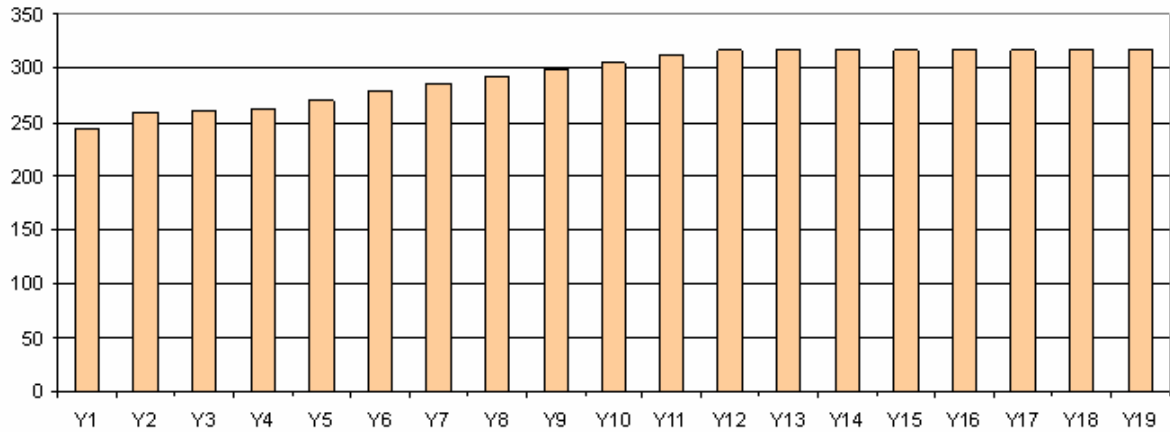
Source: IDATE

Results for Taipei case are also quite encouraging: very high density and a large reuse of existing ducts are the main reasons explaining those results.

Indeed, simulations for Taipei, taking specific hypothesis show a cumulated Free Cash Flow positive on year 8. Investment per home passed is vey low ranging from 250 to a maximum of 320 US $ at the end of the period.

III - Local Authorities involvements in FTTH

1. Introduction

The involvement of local authorities in deploying the first FTTH/B networks is not the same in all the geographical zones considered. In some Northern European countries, where their involvement is considerable, coverage is high also because of the efforts of local utilities groups and even the property managers they control.

In the United States, however, such involvement has had little impact on the total volume of enabled FTTH connections, most of which are the result of direct investments by operators (RBOCs), even though the number of FTTH projects by public players is high in this country. Lastly, in Asia, especially in Japan and South Korea, local authorities' involvement in deploying FTTH/B networks is still marginal.

The change since last 18 months has been the involvement of National Government to promote and also invest in neutral Fibre networks. On this particular subject even if Europe and The USA are active, it is in the Asia Pacific region where National initiatives are the most important as the Australian Plan (NBN) and the New Zealand plan for instance.

In addition to the gathering networks deployed by municipalities to connect telephone distribution frames and thus encourage unbundling, and networks primarily aimed at covering business parks and major public sites, this report mainly concentrates on fibre optic networks for residential users. Several questions are thus raised concerning the FTTH strategies adopted by local authorities, in particular:

- What are the main factors that encourage local authorities' involvement in FTTH/B networks?
- What are the main decision-making criteria?
- What business models are used for their intervention and who are the active players?
- Do local authorities have the resources to build and even operate such networks compared with operators?

Based on a panorama of FTTH deployments by local authorities worldwide as well as National initiatives, this report allows readers to understand the opportunity FTTH represents for local authorities and which are the principal methods implemented for their intervention. By considering the global initiatives, the aim of this preliminary analysis is to identify the advantages local authorities enjoy and the risks they take in embarking on a business which appears to go beyond their direct field of intervention.

2. Panorama of FTTH/B initiatives by local authorities in Europe

2.1. Very high broadband in Europe: 2009 market situation and the role of local authorities

As in previous years, IDATE has been commissioned by the FTTH Council Europe to provide an overview of the status of FTTH rollouts across Europe at the end of 2009. To date, IDATE has identified 249 FTTH/B[4] projects in Europe, of which 136 are new initiatives since June 2005.

Table 2: Significant FTTH/B rollouts in Europe, at end 2009

Countries	Players		Homes/Buildings passed (December 2009)
Denmark	DONG Energy	Power utility	180 000
Finland	TeliaSonera	Incumbent	450 000
France	France Telecom	Incumbent	570 000
	Illiad/free	Alternative operator	370 000
	SFR	Alternative operator	380 000
	Numericable	Cable operator	4 400 000
Germany	Wilhelm Tel	Public	200 000
	M-Net	Public	120 000
	NetCologne	Power utility	150 000
Italy	Fastweb	Alternative operator	2 000 000
	Telecom Italia	Incumbent	100 000
Netherlands	Reggefiber	Infrastructure operator	500 000
Norway	Lyse / Altibox	Power utility	210 000
Russia	Beeline (Vimpelcom)	Alternative operator	8 000 000
Slovakia	T-COM	Incumbent	315 000
	Orange Slovensko	Alternative operator	285 000
Slovenia	T2	Alternative operator	310 000
	Telekom Slovenije	Incumbent	105 000
Spain	Telefonica	Incumbent	150 000
Sweden	B2	Alternative operator	460 000
	TeliaSonera	Incumbent	250 000
Estonia	Elion	Incumbent	110 000
Hungary	Magyar Telecom	Incumbent	160 000
Portugal	Portugal Telecom	Incumbent	800 000
	Sonaecom	Alternative operator	200 000
	ZON	Cable operator	150 000

Source: IDATE for FTTH Council Europe

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[4] Fibre To The Home or Fibre To The Building (not including FTTN+VDSL)

Municipalities and utilities are still the main category of players involved in FTTH/B deployments in Europe as they represent 55.7% of total number of projects. Nevertheless, they are still giving ground to alternative players which, even if they only represent 28.7% of total number of projects, reach 74% of FTTH/B Homes/Buildings Passed.

In terms of subscribers, alternative operators still dominate the market. Those which were involved first in FTTH/B deployments represent the most important customer base: all together, FastWeb (Italy), B2 (Sweden), Illiad/Free, Numericable & SFR (France), Orange Slovensko (Slovakia) and T2 (Slovenia) at the end of 2009 totalled 841,500 subscribers, or around 24% of Europe's FTTH/B subscriber base (including Russia). However, this figure is lower than a year ago. This is mainly due to the involvement of incumbents which have been deploying largely in 2009 after months (and sometimes years) of expectation for regulation clarification.

- New FTTH/B markets, mainly in Eastern Europe, are very dynamic. Countries such **as Lithuania, Estonia and Czech Republic** are among the most dynamic in terms of new FTTH/B subscribers during second half 2009.

- Sweden, third country in terms of number of new subscribers between June and December 2009, is still a very dynamic market where local and national players continue to convince end users to subscribe to services based on FTTH/B architecture. On the other hand, the coverage is still increasing, and the consequence it a lower penetration rate in the country compared to end 2008.

- At end 2009, **4 countries have entered the Global Ranking**, meaning that more than 1% of households have subscribed to a FTTH/B service: **France, Czech Republic, Portugal and Bulgaria**.

- The majority of subscribers (around 67% of FTTH/B subscribers at end 2009) is concentrated in 7 countries in Western and Northern Europe: Sweden, Italy, France, Norway, The Netherlands, Denmark and Germany.

Figure 31: Evolution of FTTH/B * subscribers in Europe
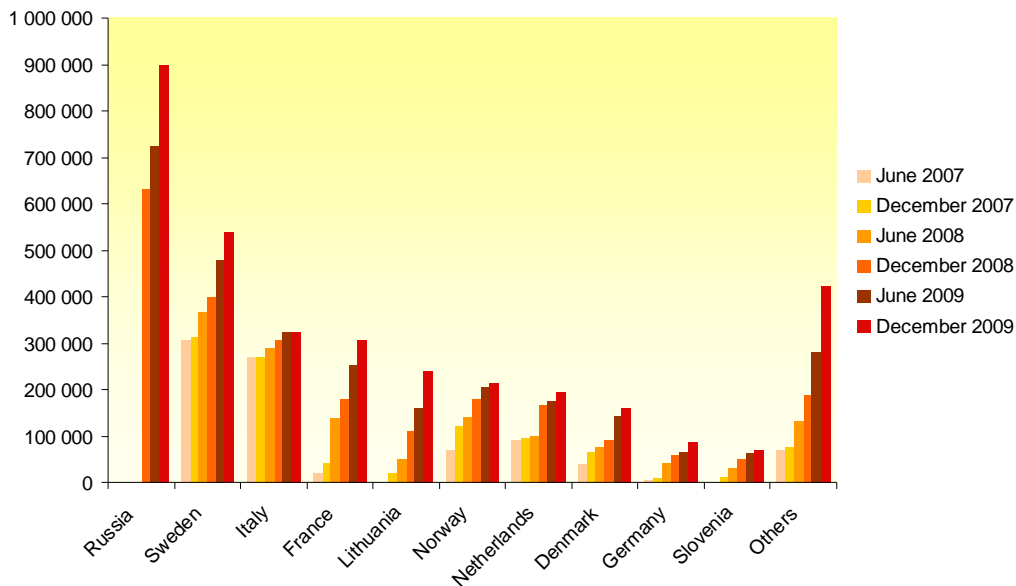
(*) We refer here to the definition of FTTH/B from the FTTH Councils
Source: IDATE for FTTH Council Europe

Figure 32: Evolution of FTTH/B * homes passed in Europe
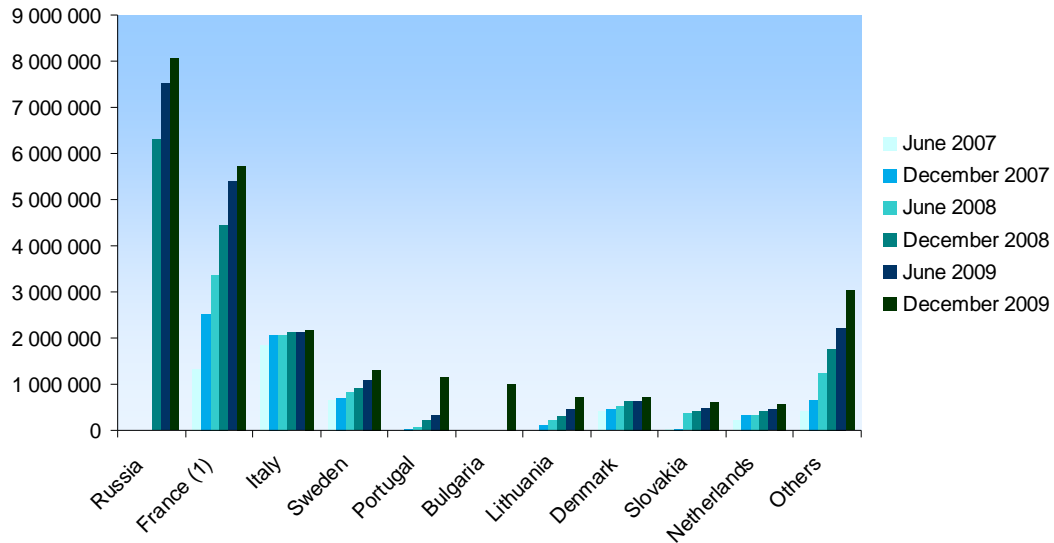
(*) We refer here to the definition of FTTH/B from the FTTH Councils
Source: IDATE for FTTH Council Europe

Excluding Russia, which leads the FTTH/B market in terms of subscribers and Homes/Buildings Passed due to its specific demography, France is still ahead of all other European countries at the end of 2009. But other countries have shown a strong growth and are now positioned among the 10 leaders in terms of number of Homes/Buildings Passed. This is the case for Portugal, Bulgaria and Lithuania which are respectively n° 4, 5 and 6 at end 2009.

2.2. The backing of neutral, open access networks in Northern Europe

It now seems to be the case that countries in Northern Europe are often the precursors of innovative technology in Europe. This was again confirmed with the deployment of FTTH networks in Scandinavia, which began towards the end of the 1990s-early 2000s.

Even in the earliest network deployments, local authorities played a major role, either directly or via subsidiaries specialising in the supply of utilities or in managing real estate. Most networks deployed are neutral and open (*Open Access Networks*) and this model is considered the example to follow in other Nordic countries.

In both Sweden and Denmark, FTTH networks are operational and their success is growing among users; in the rest of Europe, the market is still in its infancy, with the relevant players (local authorities included) still mulling over the best strategy to adopt.

2.2.1.   The Swedish example

Covering almost the same surface area as France, Sweden has 9 million inhabitants, with two-thirds concentrated in the south of the country. Sweden is comprised of 291 municipalities and 155 city networks.

40% of Sweden's population lives in single-home residential areas and 60% in multiple dwelling units (MDUs). Of the 1.3 million FTTH/B homes passed, some 537 000 are currently subscribers.

In 1999, the Swedish Government declared that each home would have access to very high broadband, and a budget of 3 billion EUR was granted to local authorities and power utilities to build infrastructures.

Several main characteristics concerning FTTH can be identified in Sweden today:

- As a general rule, the efforts of local authorities have been a decisive factor in implementing open and shared FTTH networks. They have funded all open access networks, either directly or via utilities companies which they control 100%, and have received public subsidies for this, especially in rural areas. Without the intervention of municipalities, most open access networks would not exist today;

- Of the 155 FTTH networks developed to date, only 10 to 15% have a sufficient level of performance to provide the necessary range and quality for Internet and TV solutions. There are plenty of "small" networks with several hundreds or thousands of subscribers, but this does not appear adequate enough to attract access providers and ensure the required financial equilibrium.

- In rural areas, communities have united to interconnect their FTTH networks in order to find a new point of equilibrium. This approach by VHB networks should help generate the required competitive spirit among Internet Access Providers (IAPs), increase revenues and thus encourage the modernisation of some obsolete infrastructures.

- It is in places where real-estate companies are involved that FTTH networks work best, since they develop the traffic and ensure that the operation is profitable. Networks in buildings are currently built using copper or optical fibre. The choice of technology depends on decisions concerning CAPEX/OPEX, although fibre is ultimately the preferred choice.

This model involves lessors, infrastructure operators, communication operators and service providers:

- for lessors: investment in the network inside the building, depreciated in the medium term, where revenues help optimise the ROI (calculated as an average over a five-year period), with an increase of about 5 to 7 EUR/month on all rents. In addition to the financial considerations, investment in optical fibre helps enhance the value of the lessor's property.

- for infrastructure operators: planned and optimised investments which benefit all electronic communication operators, without discrimination, and which allow cities to develop their own internal service. Revenue for these operators comes from leasing their networks to electronic communication operators who are responsible for activating them.

- for electronic communication operators: greater profitability when more service providers are involved.

- for service providers: the possibility of reaching new customers without having to invest in the infrastructure, allowing them to concentrate on their service solutions.

- for end users: a much wider choice of available services, greater service reliability, the ability to change service providers without interrupting the service.

-

As a general rule, FTTH is developed in a very pragmatic manner and the market is being pulled along by television, particularly HDTV and VOD. **However, Internet services remain a priority** and fierce competition is mounting among IAPs, with varying rates depending on factors such as the duration of contracts, symmetric access (or not), specific commitments, etc.

For the services subscribed to, on average, an estimated 70% of subscribers have 10 Mbps and 30% have 100 Mbps. A few offers for 1 Gbps now appeared in Sweden.

FTTH services are generally very competitive compared to DSL services and are similar in price or even cheaper, generating a significant rise in the 10 Mbps/100 Mbps access commercialised.

In terms of usage, other services identified include movies, music, archiving and data storage. Eventually, the market will move to IPTV.

Lessors are also starting to use networks for their own purposes (remote utilities management, alarms, surveillance, etc.), although these services are not the drivers for building VHB networks.

An analysis of the two initiatives undertaken by the cities of Stockholm and Vasteras helps provide a better understanding of the "Swedish model" for open access networks.

Stockholm, "FTTH City"

For several years now, the City of Stockholm has often been cited as an example illustrating the methods for intervention by public authorities.

With 1 250 000 inhabitants, the city and its suburbs has a base of some 400 000 dwellings.

The mayor of Stockholm soon became concerned about competition opening up and the amount of civil engineering work being conducted in his city. He decided to reduce these works, provide the 50 000 municipal employees with their own service, and develop an open access network for everyone.

The municipality's strategy was to intervene in the deployment of optical fibre at several levels, making best use of the skills of each of its various subsidiaries to provide VHB access to the entire population, including its local government offices. The City particularly sought to:

- improve the well-being of its citizens and quality of municipal services,

- shake up the real-estate sector and help develop the city,

- be identified as a sustainable city ecologically,

- reduce the digital divide and bolster democracy,

- shake up the economy.

The municipality thus relied on its subsidiary Stokab created in 1994 in an aim to provide Stockholm with a fibre optic telecommunications infrastructure. The mission entrusted to it by the municipality of Stockholm is based on a parliamentary decision intended to establish an "information society for everyone" (Law established in 2004: "From an IT policy for society to a policy for an IT society").

Stokab has now deployed a very high performance network in the city centre and across a large part of the county. Stockab's objective in the city centre is to connect up all the districts, i.e. 6 000 end connections. Stokab is defined as a carriers' carrier, deploying neutral and open dark fibre optic networks.

Stokab is confident it can intervene to accommodate any general objective the municipality wishes to achieve, by installing a fibre optic infrastructure accessible by all, via the use of service platforms, and by supplying most new building developments.

Three classes of service are offered to electronic communication operators under three-year contracts:

- entry fee: 2 000 EUR/year

- incoming fibre optic link from nodal point : 150 EUR/month

- point-to-point link between two nodal points: priced per linear metre.

In addition to Stokab, which is involved in the horizontal part of fibre optic networks, the City of Stockholm has encouraged lessors to deploy their own fibre optic infrastructures (vertical networks), in order to reach citizens more directly. The municipality itself has three leasing subsidiaries: Svenska Bostader, Familje Bostader and Stockholmshem. Historically, these three lessors managed buildings based on geographical factors. With a real-estate extension, this division should gradually disappear, leading to a reorganisation of the whole property management system. Whatever happens in the future, the three leasing companies have now deployed vertical networks in their buildings to supply tenants with FTTH.

Lessors then call upon communication operators entrusted with activating and operating the infrastructure and commercialising it to service providers who, in turn, are the ones in direct contact with tenants. The previous diagram of the Swedish model helps show the relationships and financial flows between the different players in this model, from infrastructure operator in the public domain to end user.

For Svenska Bostader, one of Sweden's largest lessors, with 43 000 dwellings and 5 000 commercial premises in and around Stockholm, the basic mission is to lease accommodation to residential users, most of whom have a PC and need an Internet connection. Seeking faster and faster transmission speeds, this is just the start of an ever-growing demand for such services. Households also want to be free to choose their IAPs. It is thus essential for Svenska to proceed with this strategy and ensure it is the best in the market. According to lessors, freedom of choice implies true competition between the IAPs and hence, a very high quality of service is maintained while rates are kept in check. In order to

guarantee new investments, Svenska receives revenues from both the communication operator activating the network, and from tenants paying a rent increase of about 1%.

For an average rate of 40 EUR to access a 10/100 Mbps service (uplink/downlink), the takings are typically shared between the parties as follows:

- IAP (25%)
- communication operator (40%)
- FON operator (10%)
- lessor (25%)

By setting up Stokab, a neutral FON infrastructure operator, the city's role was essential in boosting FTTH development while keeping services competitive.

Västeras

Another famed example of FTTH deployment initiated by a local authority is Västeras, Sweden's sixth major city with 130 000 inhabitants and 60 000 homes, 60% of which are connected.

The municipality used its utilities provider, Mälarenergi Stadsnät, founded in 2000, as its intermediary for the coverage of all homes and businesses across its territory.

Mälarenergi builds the network to the foot of the building, which it then connects to the vertical network installed by lessors. The building's internal network thus belongs to the lessor, but although Mälarenergi's network stops at the foot of the building, it still offers a maintenance service for the internal network.

Mälarenergi is both an infrastructure operator and a communication operator, both building and operating the VHB network.

The business model for revenues is as follows:

Table 3: Rates for services available on the Västeras network

Service	Total rate to end user	comprising Malaenergi's rate	comprising IAP's rate	Telia or other	Annual return
Internet 10 Mb	15€ / month	10€ / month	5€ / month	28€ / month	156 €
Internet 100 Mb	33€ / month	17€ / month	16€ / month	80€ / month	564 €
Telephony	7€ / month	2.50€ / month	4.50€ / month	20€ / month	156
Wimax	33€ / month	10€ / month	23€ / month		

Source: Mälarenergi

The network offers 110 services supplied by 30 service providers, the main ones used being Internet, television and telephony. Schools, libraries, hospitals, private and free clinics are all connected.

The lessor's investment amounts to an average 270 EUR per cabled apartment and 270 EUR per connection to the urban network, i.e. 540 EUR in total per apartment.

Mimerbygg's 6.5 million EUR investment in cabling 12 000 apartments is mainly funded by equity capital and bank loans, together with some State subsidies.

The lessor is directly remunerated by all tenants in the building, by increasing their monthly rents by 4.50 EUR. The investment is depreciated over a ten-year period.

Investment in the City of Västerås is broken down as follows:

- for the network's optical fibre: 10 million EUR, 70% of which is for civil engineering, 15% for active equipment and 15% for optical fibre;
- for equipping buildings/houses: 12.9 million EUR, 70% of which is for civil engineering, 15% for active equipment and 15% for cable.

The city now has 20 000 FTTH subscriber homes and all have access to a competitive services solution enabling them to enjoy very high speeds at rates lower than those offered directly by IAPs (up to 150 EUR saving for the year for 10 Mbps Internet access).

The success of the City of Västeras' involvement is indisputable: the neutral open access network it has installed has allowed numerous service providers to offer solutions to its inhabitants and the city's revenues are virtually guaranteed as there is no risk of churn (inhabitants are connected to its infrastructure whatever service provider they subscribe to).

This Swedish neutral open access network is often cited as an example, not just because it is relatively common throughout the country, but also because it highlights the role of public players. However, the situation is not the same in all countries. Sweden has a high number of telephone service and Internet access providers, but there are few triple-play solutions available (bundling phone, Internet and TV).

In view of these deployments by public players, the incumbent operator TeliaSonera's positioning is somewhat unusual, since it is both a communication operator and a service provider. The presence of neutral open access networks does not seem particularly problematic for TeliaSonera, since it is able to position itself in such a way that it can operate or use the networks to serve its own end customers. TeliaSonera's strategy is also to extend the fibre optic networks as quickly as possible, due to its decision to cease using its copper telephone network for new residential areas, forcing residents to migrate to very high broadband.

2.2.2. Local authorities' FTTH projects in urban areas: the Dutch example

Amsterdam

The City of Amsterdam sets itself apart with its initiative to deploy a neutral open access network called CityNet.

At end-2009, 46 000 homes were connected for an investment of 37 million EUR. The long-term objective is to cover 420 000 homes and businesses.0

The installed network is a passive open infrastructure using Ethernet technology, with a pair of fibres per household. The network is initially owned by a local company, GNA (Glasvesel Amsterdam CV), a third of whose capital is controlled by the City, another third by ING Real Estate and Reggefiber, and the final third by the commercial branches of five real-estate companies.

In February 2009, Amsterdam announced a new agreement between initial shareholders and Reggefiber/KPN (Earlier in 2008, KPN acquired control of Reggefiber which is among the initial partners of the project). The plans were changed and the targets set to another 100,000 open access fiber connections. The firm structure changed as well. With the new deal the city and the housing corporations now holds a 30% share of the firm (currently holding approx. 33% shares each) while Reggefiber assumes the remaining 70% of ownership.

Amsterdam Citynet is still operating under an open access network principle. At December 2009, 6 provider were providers: Toltech, Concept ICT, DigiProfs, Alice (BBned) and InterNLnet

However, the project, which began in 2001, has been fiercely opposed by other operators present in Amsterdam, especially the cable operator Liberty Global, which considered this type of project, part financed using public funds, represented a distortion of competition.

The project received the European Commission's approval, however, which judged that the City had acted like any other investor in a market economy, basing its project on a realistic business plan. The fact that private investors were also involved, further endorsed this view.

Appingedam

Appingedam is a relatively small town (12 500 inhabitants) in the north of the Netherlands (Groningue Province). In February 2004, the town council voted to deploy an FTTH/B network to speed up broadband and very high broadband coverage across its territory. However, unlike Amsterdam, whose project was validated by the European Commission, this time the Commission decided in July 2006 to prohibit public funding for building an open access fibre optic network in the Dutch city of Appingedam. This project actually involved a region already covered by broadband networks (KPN, cable operators) and the Commission considered that the aid in question was not needed to address any malfunction of the market or excessive pricing for broadband services. The Commission deemed that the projected aid would cause a distortion of competition and harm private investment in such a way that these negative effects would outweigh the project's positive impact.

However, while this decision was being handed down, the Dutch Government ratified a law permitting municipalities to invest in deploying FTTx networks and the Appingedam project was revived.

2.3. The premises for local authorities' FTTH/B initiatives in France

2.3.1. Regulatory framework

Since 2004, Article L.1425-1 of the CGCT (French Code governing the territorial authorities of the country's Regions and Departments), inserted in the "clauses pertaining to certain local public services" of this code, authorises local authorities:

- to establish and operate electronic communication networks, to acquire the usage rights for these networks and to purchase existing networks and infrastructures and make them available to independent network users or operators;
- to supply electronic communication services to end users, normally after demonstrating the insufficiency of private initiatives to satisfy the needs of end users.

In application of Article L.1425-1, paragraph 1 of the CGCT, the intervention by territorial authorities and their groupings must furthermore be consistent with public initiative networks, ensure the sharing of infrastructures established or acquired, and observe the principle of equality and free competition in electronic communication markets.

In practice, territorial authorities can now install true electronic communication networks, comprising passive infrastructures and active equipment, and offer service solutions (dark fibre, provision of bandwidth services, access, hosting, etc.) by adopting a carriers' carrier model.

Supplying services to end users is still highly regulated and requires a clear demonstration of the lack of private initiatives: in practice, most broadband projects initiated by local authorities are based on carriers' carrier models, where only very small-scale projects offer services to end users in isolated areas.

Article L.1425-1, IV of the CGCT also stipulates that when "the economic conditions do not guarantee profitability for the installation of electronic communication networks that are accessible to the public or for the activities of an electronic communication operator, territorial authorities and their groupings may make their electronic communication infrastructures or networks available to operators at a rate which is lower than the cost price, in accordance with the terms governing transparency and non-discrimination, or they may compensate for their public service obligations by granting subsidies via a public service delegation or a public contract".

Figure 33: Field of local authorities' intervention, following the 2004 regulatory changes in France
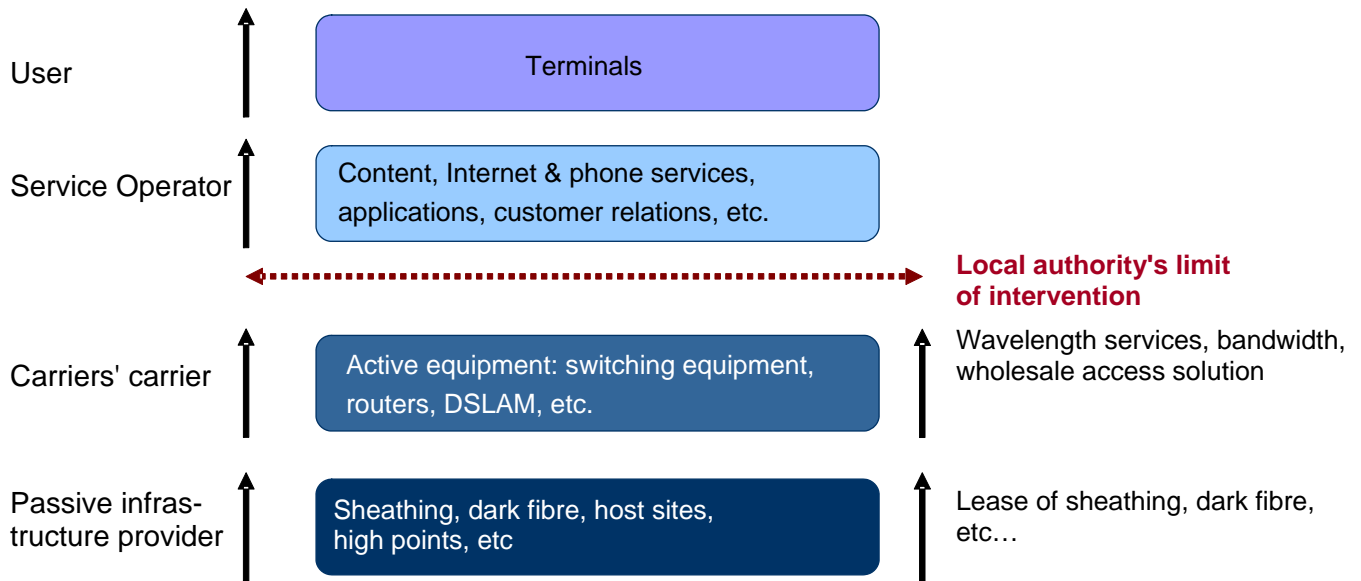
Source: IDATE

2.3.2.   Broadband & FTTH projects driven by local authorities

In France, local authorities have been involved in high speed for a long time now. Their involvement is more or less deep according to their objectives and in most cases, local authorities decide to invest in the deployment of a backhaul network, covering a large part of their territory. Their first objective is to enhance competition in their territory.

Figure below (from ARCEP) shows the dispatch of broadband projects initiated by local bodies at end 2009. It includes projects from Regions, Departments and smaller authorities and shows the current status of the project (from "preliminary study" to "operational").

In the table below are presented detailed information for some operational projects

Figure 34: Local authorities involved in a Public Initiative Network (2009)
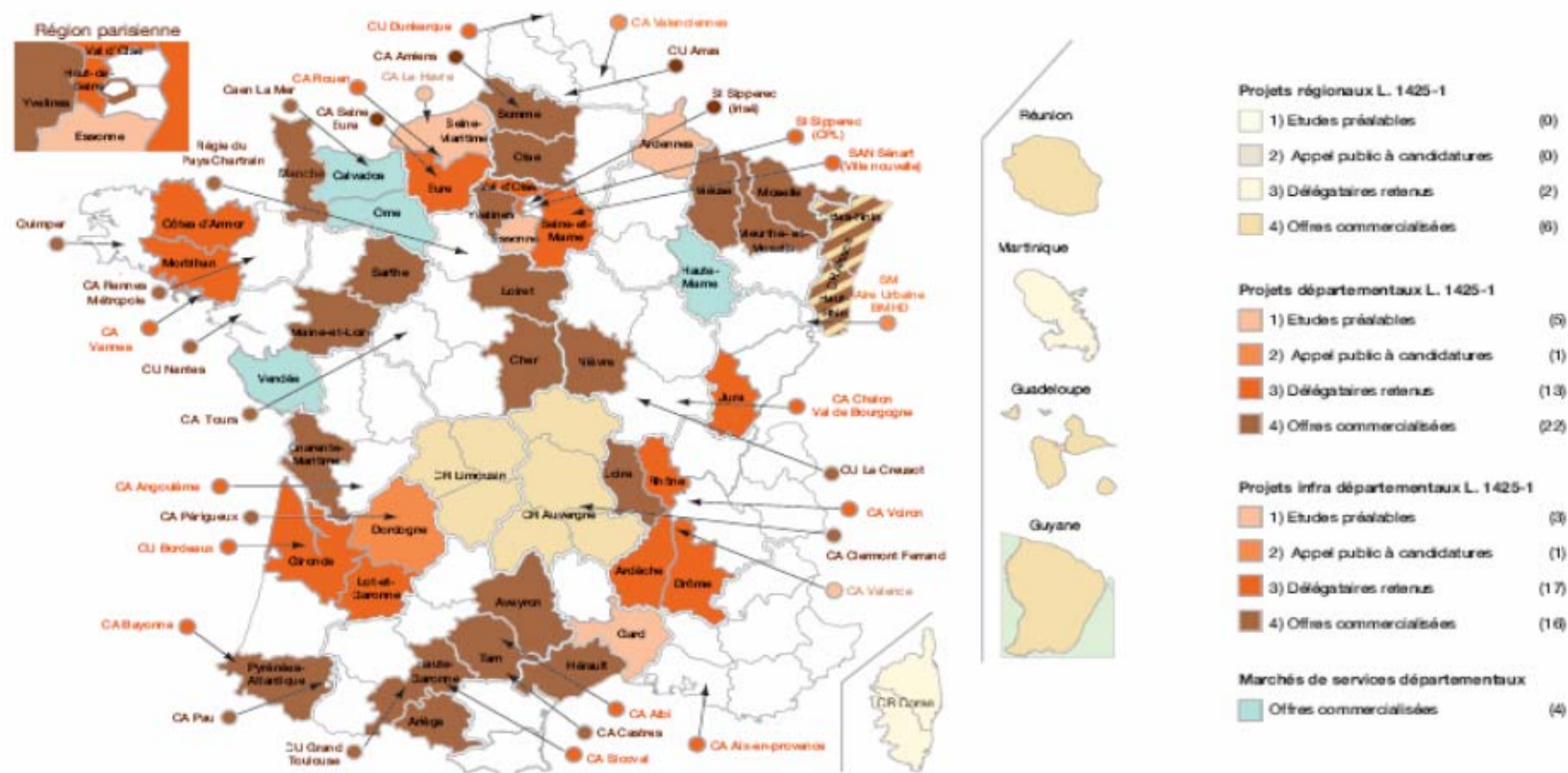
Source: ARCEP

Table 4: Detailed information of main operational projects initiated by local bodies

Local body / name of network	Key players	Project scheduling for construction of network	Total investment (EUR million)	Public investment (EUR million)	Mean of access
Debitex	LD Collectivites	2006 – 2013	55	15.8	Dark fibre
Gravelines	LD Collectivites	Na	3.3	0.5	Na
CG Haute Garonne / Réseau Haut Débit Grand Public	Altitude	2006 – 2007	4	4	Wholesale
CG Meurthe et Moselle / Proximit@	LD Collectivites - Eiffage	2006 – 2009	148	46	Wholesale
CG Moselle / RHD57	LD Collectivies – Vinci - Axia	2004 – 2006	68.9	68.9	Wholesale
CG Nièvre / Niverlan	Axione - ETDE	2005 – 2008	42.4	25.6	Wholesale
CG Sarthe / S@rtel	Axione – Sagem - Cegelec	2004 – 2007	38	22.7	Wholesale
CG Seine et Marne / Sem@for77	Marais – Vinci - Axia	2007	85	32.7	Dark fibre
CG Hérault / Num'Herault	Vinci – LD Collectivites – Sogetrel – Covage	2006 – 2009	82.1	27.9	Wholesale
CG Hauts de Seine / THD92	Numericable – LD Collectivites – Eiffage	2006 – 2015	422	59	Dark fibre
CA Caen la Mer / RDC	Covage – Marais Contracting	2004 – 2006	9.57	7	Dark fibre
CA Grand Toulouse / Toulouse Garonne Networks	Covage – Vinci – Axia	2002	6	6	Wholesale
CA Pau-Pyrénées / Pau Broadband Country	Axione	2003 – 2004	26.5	20	Wholesale
Region Alsace / Alsace Connexia	LD Collectivites – Est Videocom – Sogetrel	2004	37.2	20.4	Wholesale
Region Limousin / DORSAL	Axione – Sogetrel	2005 – 2008	68.6	38.4	Wholesale

Source: IDATE

Apart from those specific deployments, some local authorities have already engaged FTTH/B deployments (see Figure 4 for geographical positioning and Table below for details of each project). In February 2010, about 10 local authorities have launched such projects. In most cases, except Pau Broadband Country which was the first FTTH project initiated by a local body in France, those networks are accessed via passive offers (dark fibre).

Figure 35: Main FTTH/B deployments by local authorities in France (February 2010)
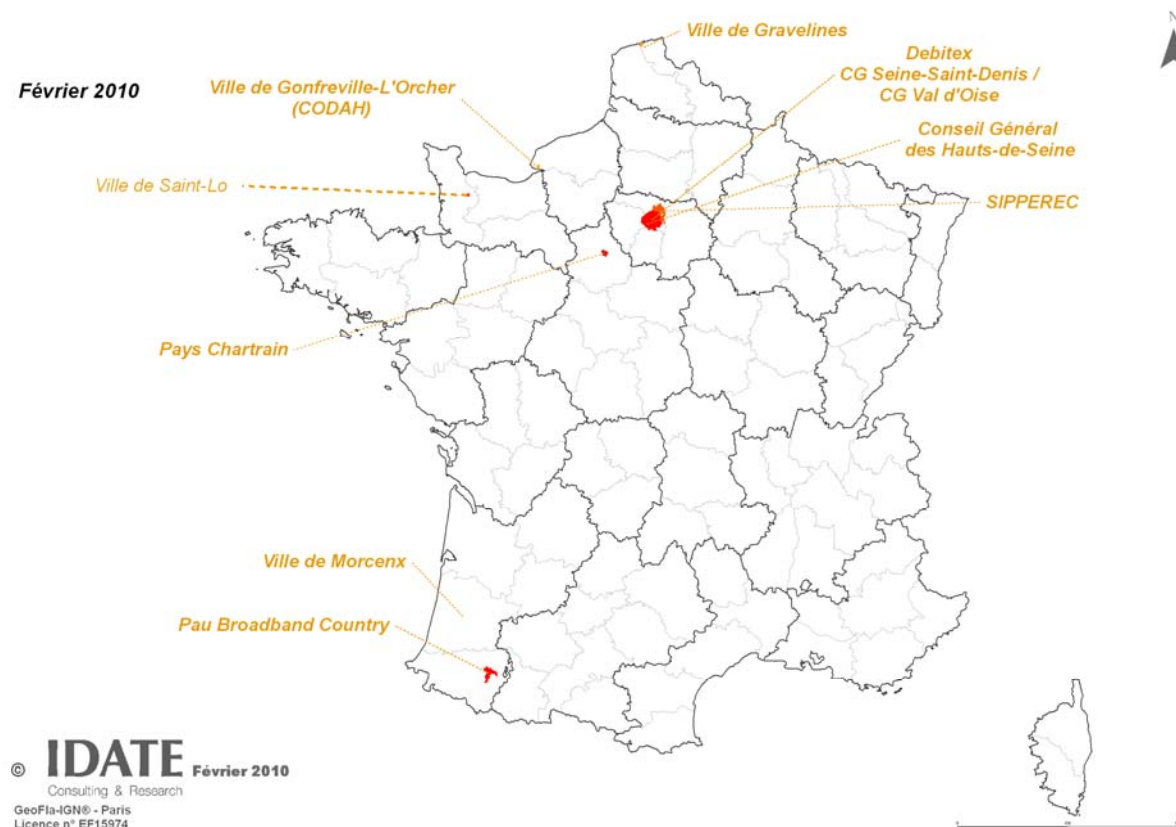
Source: IDATE

Table 5: Description of main FTTH/B projects from French local authorities

Localization	Main characteristics
Debitex	DEBITEX is an EPCID (a French public institution for cooperation between Departments) uniting the Councils of the Departments of Seine-Saint-Denis and Val d'Oise and whose objective is to develop very high broadband across 27 municipalities in the north and east of Paris. In May 2007, DEBITEX launched a public service delegation (PSD) to install an FTTH network.
	The main aims were:
	• to provide a fibre optic connection for major public sites in the territory (city councils, primary and secondary private and public schools, colleges, research centres, training centres, hospitals, etc.),
	• to provide a fibre optic connection and coverage to some one hundred business parks,
	• to provide a fibre optic connection, at least to the foot of buildings, to the multiple dwelling units included in the territory's urban renovation programmes, and in some dense residential areas: 120 000 or so dwellings will thus have optical fibre coverage.
	Selection of the concessionaire occurred in February 2009 (LD Collectivites). The PSD is engaged for a 25-year period. First phase of roll out will be launched in 2010 and will last until 2013. This first phase will cover 95 000 households.
	Total investment for this project will reach EUR 55 million.

Localization	Main characteristics
Gonfreville l'Orcher (CODAH)	In December 2005, the city of Gonfreville l'Orcher has decided to launch a FTTH project. The first objective of the municipality was to modernize the information/alert system and to allow all citizens to benefit from services equivalent to those provided in big cities. Decision to roll out a fibr optic infrastructure was taken with the aim to pass 3,500 homes and 300 buildings.

The CODAH (Communauté d'Agglomération de la region Havraise), which has the "carrier's carrier" skill for all cities of the community, took in charge the project: financial involvement and management of the project, but deployment made by an external provider (Axione), under a public delegation services scheme. Roll out began by 2008, planned to end at Automn 2008.

Total budget: about EUR 5.25 million |
| **Gravelines** | The city of Gravelines has decided to upgrade its cable network to FTTH. The city has launched a DSP, committed to LDCollectivités for a 15-year period.

The network passes 5 000 homes and total budget for roll out reaches EUR 3.3 million among which EUR 450 000 from public funds (EUR 90 per home passed).

It is the first time in France that a local cable network is evolving to an open access FTTH network. |
| **Hauts-de-Seine** | The Council of the Hauts de Seine Department launched a concession type public service delegation for the installation of a fibre optic network, intended to deploy a neutral open access infrastructure to all homes and businesses in the Department. The Council's decision was based on its observation that the existing broadband service did not perform well enough to satisfy changing needs and that, although many operators were present in the territory, their plans to deploy optical fibre did not ultimately cover all inhabitants, creating a new digital divide and threatening to harm competition. The Council was also keen for the Department to remain appealing and competitive, particularly to companies, by encouraging them to establish their headquarters there rather than other major cities like London and Barcelona.

At the end of 2007, the Department selected the consortium Numericable/LD Collectivites/Eiffage to build a passive network, and to operate it under a 25-year contract (with an initial set-up investment of 422 million EUR and a public subsidy of 59 million EUR).

The network is expected to cover more than 2 500 km across the entire Department, with 830 000 enabled connections (130 000 connections for companies and 700 000 for individuals). Due to be completed at the end of 2012, the average cost per connection will range from 300 to 2 000 EUR depending on the areas covered, with an average cost of 500 EUR.

It should be noted that this project has been reviewed by the European Commission to determine whether or not the public subsidy is legitimate, and the decision was that it was indeed legitimate. Several operators had actually lodged legal appeals challenging this project, believing that it may distort competition in a territory in which they themselves have already invested. In addition to private operators, this project has also been received with some reticence by SIPPEREC (the Paris periphery joint board for electricity and communications networks) whose coverage zone includes some of the Hauts de Seine municipalities and which itself has launched three public service delegations for electronic communication networks (see hereafter). |
| **Morcenx** | Morcenx is a small rural town located in Landes. Since 2002, the municipality deploys ducts when any civil work is engaged. Therefore, the municipality now has 5 km of fibre optic covering its entire territory, which represents 5 000 homes/businesses.

In 2007, the municipality of Morcenx adopted a specific business model: it decided to rent black fibre optic to operators, as a DSP would not be viable in such a small town.

Several national players have already announced their intention to rent fibre optic in Morcenx among which the incumbent, France Telecom, Free and SFR. |

Localization	Main characteristics
Pau Broadband Country	Pau Broadband Country is the first real FTTH project launched by a local authority in France. In July 2003, a DSP was signed between the Communauté d'Agglomération de Pau and Axione in order to roll out a fibre optic network with the objective to cover 40 000 households. The company SPTHD (Société Paloise pour le Très Haut Débit)/Axione was in charge of the deployment, management and operation of the network.
	Roll out occurred between 2003 and 2004 and the first commercial offer was launched in September 2004.
	Mediafibre (previously IPVSET), was one of the first ISP to provide services over the FTTH network. The company was acquired by SFR/Cegetel in late 2006.
	To date, the network passes 47 500 homes.
Pays Chartrain	2 000 households are concerned by the fibre optic roll out. This project was initiated by the local utility, Régie d'Electricité du Pays Chartrain in order to provide end users an efficient access.
SIPPEREC	SIPPEREC (the Paris periphery joint board for electricity and communications networks), whose coverage zone includes some of the Hauts de Seine municipalities, has launched three public service delegations for electronic communication networks (see hereafter):
	• Sequantic (an open access network over optical fibre covering dense financial areas),
	• Opalys (a fibre optic network for private users in some Hauts de Seine communities),
	• Irisé (a dark fibre gathering network, mainly serving telephone distribution frames).
	Opalys is the FTTH project by SIPPEREC to residential users and concerns 22 400 households passed.
Saint Lô / Manche Numérique	The Manche Numérique joint venture unites most of the local authorities present in the Department of the Manche. Manche Numérique has installed a gathering network (BUS) across its territory which is now operated by the assignee, Manche Télécom.
	An endorsement to the agreement between Manche Numérique and Manche Télécom was signed in order to include an FTTH deployment plan: in the first phase, planned to end September 1, 2009, the assignee's objective is to install 26 000 FTTH connections across the urban community of Cherbourg and the municipal community of Saint Lo, with investments of around 12 million EUR. The architecture is planned to be a passive network using point-to-point or PON technologies, for use by all operators.
	The assignee's revenues will come from commercialising the FTTH connections to operators: this exercise was considered viable because of the low investment cost per connection (under 450 EUR), allowing the assignee to finance the project itself. It therefore receives no specific public subsidy.
	Commercialisation of services over Saint Lo's FTTH network has been launched in December 2009. Cherbourg's network is planned to be ready for commercialisation in a few weeks/months.

Source: IDATE

The main characteristic of FTTH/B roll outs initiated by local authorities is that there are open access networks. Generally, the authorities decide to engage a deployment because of the lack of private initiatives due to the low commercial potential compared to high investment required. Then, networks deployed are open to any players; operators, ISPs, that eventually want to provide to citizens living in the concerned territories.

In most cases, the FTTH/B networks are deployed under public service delegation (PSD) contracts for 15 to 25 years. Total budgets are shared between public and private players involved in the deployments, none of them being the only ones to bear the high amounts engaged. Private players involved are generally national infrastructure operators, specialised in deployment, management and maintenance of telecom networks.

EC's position regarding such project is not really drastic. Indeed, even for the Hauts-de-Seine project, which caused many reactions from national and local players because of the already high level of coverage in that territory, the EC concluded that the public commitment was legitimate.

2.3.3. Service solutions offered by FTTH project assignees to operators

As seen, only a few public service delegations have so far been introduced for FTTH networks. However, early trends seem to favour services solutions aimed at retail operators.

Several passive solutions are usually offered:

1 – Long-term access rights to fibre optic connections linked to an Optical Connection Node:

With this type of solution, the client-operator first purchases the right to use (for a period of 15 to 20 years) all or some of the fibre optic connections linked to an OCN, for the OCN–dwelling link or the OCN–floor link, depending on the case. It must therefore pay a usage charge, billed just once, costing between 200 to 300 EUR (excl. taxes) for each individual connection (not for each of the client-operator's active subscribers).

Added to this usage fee is the lease cost for each active subscriber. If dark fibre is leased, the client-operator pays a service access fee for each active subscriber (100 to 200 EUR, excl. taxes) and a monthly charge of between 4 and 6 EUR (excl. taxes).

2 – Monthly lease solution for accessing the local optical loop from the Optical Connection Node:

Unlike the previous solution, the client-operator does not pay an access fee corresponding to the number of enabled connections, but for each active subscriber and for the OCN–dwelling link or the OCN–floor link, it simply pays a service access fee (100 to 200 EUR, excl. taxes) and a monthly charge of between 12 and 18 EUR (excl. taxes).

3 – Solution for leasing optical fibre on the riser link:

This solution supplies fibre exclusively on the vertical part of the network inside the building, for the building-floor connection point link or the building-dwelling connection point link, depending on the case. This solution is billed as a monthly charge.

2.4. National Fiber Plans in Europe

2.4.1. Greece National Plan

With a broadband penetration level of close to 13.5% at the end of 2008, Greece is among the lowest ranking countries in Europe, but news FTTH rollouts is coming at an increasingly fast pace.

First was alternative operator Hellas On Line (Hol) which announced its pioneer FTTH rollout in 2007. Hol is one of Greece's leading ISPs, with a base of around 4,000 enterprise customers and close to 100,000 residential subscribers. Its backbone of close to 800 km of optical fibre is the second largest in the country, behind the one operated by incumbent carrier, OTE.

At the start of 2009, Hol was reporting 2,000 FTTH trial subscribers, and was examining a GPON solution for an FTTH rollout.

In early September 2008, Greece made headlines in Europe's FTTH news following the announcement from its Minister of Communications of a strategic national plan, including 2.1 billion EUR in public financing over seven years, with a target of covering 2 million homes with FTTH, or 40% of the country's population. This announcement makes Greece the first country in Europe where the government is financing an FTTH deployment directly.

One of the reasons for this move is the country's special economic status in Europe which, like other countries, still has the right to invest directly in a competitive market without having to prove beforehand that competition is lacking.

The model for the rollout will be a network open to other operators and service providers, and will be based on a dark fibre offer. A minimum speed of 100 Mbps was also announced. The network's operational management will be handled by private operators in the form of a 30-year PPP (public-private partnership).

The geographical scope of the deployment was also specified, starting with coverage of Athens and Thessaloniki, followed by the country's 50 largest towns. The project will be broken down into three stages, each corresponding to a different geographical zone.

This direct government involvement in financing an FTTH deployment could serve as a template for other countries, particularly those in Eastern Europe. Nevertheless the current economic situation today in Greece will maybe force the Government to postpone the project.

Figure 36: FTTH deployment roadmap in Greece

Source: National Institute of Statistics 2001, A.T. Kearney

2.4.2. France National action for FTTH

Prime Minister's announcement

The 18th of January 2010, French Prime Minister François Fillon delivered a speech about future deployment of very high speed technologies in France.

A specific budget for very high speed

The objective of French government is to engage a specific budget in FTTH roll outs, which are considered to be initiated by now in order to offer as rapidly as possible new connection solutions to end users without discrimination.

The budget allocated to FTTH deployment and other very high speed technologies will reach EUR 2 billions. This budget will be managed by a specific fund for digital society, under the authority of the Prime Minister[5]. The government also plans to allocate EUR 2,5 billions to enhance digital content and services.

An objective: focus on FTTH, but in reality all technologies to be considered in order to provide the same kind of services for all citizens

The objective of the government is really to ensure a homogenous deployment of new technologies all around the French territory. Indeed, if a specific focus has clearly been made on FTTH architecture, obviously some areas of the territory will be concerned by other technologies, as the aim is really to provide the same service level to all citizens, on a "technology neutral way".

For instance, the Prime Minister has announced that wireless solutions will be considered is most rural areas.

Firstly, frequencies from the digital dividend will be devoted to Internet access, using 4th generation mobile technologies (LTE). In Europe in general, frequencies bands that are concerned are 790-862 MHz and 2.6 GHz. They will be attributed via auctions that will start in 2010.

Secondly, a specific focus will also be made on satellite and a part of the budget will be dedicated to the elaboration of a new generation satellite that will be able to deliver very high speed in most rural areas.

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[5] The organization of the management of that budget has not be clearly defined at that time and we don't know yet if a new government department will be created or not.

A first agenda

Some information is specific about the global program and about technologies. Concerning that last point, for instance, the schedule is that the new generation satellite is planned to be available in a 4 years time.

Regarding more generally the national program, the first deadline is summer 2010 when the program is planned to be defined precisely. To reach that objective, the DATAR and the "Directorate General of competitiveness, industry and services" have to launch a public consultation to identify the main actions to be engaged so that the dedicated budget will be allocated based on fair decisions and that it will indeed enhance other initiatives, from private players in particular. Indeed, the EUR 2 billions budget will not be enough to cover all the territory if no private initiatives or public-private partnerships are also launched.

Table 6: Key elements from Prime Minister's speech

Total budget dedicated to very high speed	EUR 2 billion
Objective	To invest in digital access and services: to deploy FTTx networks and to develop services based on very high speed access, to provide same level of solutions to all citizens.
Technologies concerned	Mainly FTTx, but also wireless technologies (from LTE to satellite) that might be useful to provide same kind of services to the whole population.
First agenda	The national plan for allocating the budget will be defined by summer 2010. To elaborate that plan, the DATAR and Directorate General of competitiveness, industry and services are in charge of a national consultation.
Players involved	Telecom operators, local authorities, manufacturers and infrastructure operators.

Source: IDATE

ARCEP's decisions

The adoption of the LME (Loi de Modernisation de l'Economie) in August 2008 has enhanced the interest for very high speed access technologies and exhorted national authorities to focus on that specific subject. Several decisions and actions have been initiated since the publication of the LME regarding the current context of deployment and the action that would have to be engaged to enhance roll out.

ARCEP has played and is still playing an important role. One of its first missions, in December 2008, was to analyse the conditions to establish in order to share infrastructures inside the buildings, which is a key element of the LME.

In December 2009, after months of consultation and trials, and after acceptation from European Commission, ARCEP has published two important decisions regarding:

- the list of players to be informed as soon as one has decided to deploy FTTH in a building,
- the conditions to be respected to access FTTH lines and the localisation of the access point in case the infrastructure is shared between several players

The location of the access point has been largely discussed as according to the LME, it is mainly located outside private property. But there are exceptions, in very dense areas, where this access point can be located inside the private property (and in general inside the building), for instance where sewers can be used to deploy fibre optic network, or in building counting at least 12 apartments.

Another main concern for ARCEP and all the players involved in FTTX deployment is the definition of the areas concerned by the previous decisions.

Indeed, regarding, among other elements, the density of population, the roll out of FTTx network can be delayed. Private players have of course prioritized their deployment in areas where the commercial potential is the highest, which means, urban and very dense areas. Elsewhere, it is important that other kind of players also get involved so that roll outs can really be engaged.

Then, ARCEP has defined 3 different zones presented in the following table.

Table 7: The 3 zones defined by ARCEP and to be considered when deploying fibre optic networks

Zone 1	**Definition**
	A subset of urban areas, representing about 5.54 million households in 148 cities.
	Characteristics
	- most viable area for private initiatives, with high infrastructure competition
	- in order to limit operators' works in buildings, ARCEP urges vertical infrastructure sharing in buildings counting at least 12 apartments
	- the first player to be present in the building has to deploy further fibre optic as soon another requires and pays for it.
Zone 2	**Definition**
	Intermediary area, called "semi-dense", where fibre optic deployments can be economically viable as soon as infrastructure sharing reaches a certain level.
	Characteristics
	- the objective here is to share at least the last mile of fibre optic networks, ensuring investments equity
	- several business model scan be considered but private-public partnerships are to be privileged to enhance deployments in areas where private players would not invest alone.
Zone 3	**Definition**
	Less dense areas, where no private initiatives will be engaged considering the low commercial potential.
	Characteristics
	- local authorities involvement will be necessary in those areas in order to propose the same kind of services to citizens living there.

Source: IDATE

At beginning 2010, only the Zone 1 is subject to precise rules. Regarding Zones 2 and 3, definition of rules is still in progress and clarification is expected by mid-2010.

In Zone 1, the first rule is that the operator that has engaged roll out informs other players so that they can ask for further fibre optic deployments (see list of operators to inform in Annex 2). When sharing is effective, this must be done in a transparent and non discriminatory way, meaning that tariff access must be the same for every player.

Some decisions have been defined for all zones and concern:

- the request for operators to propose an access offer to their infrastructures; this access is based on a passive offer, in order to allow each operator to choose the technology and active equipment it will deploy; in the case that 4 fibres per apartment have already been deployed, are operated by 4 different players and a 5th operator wants also to have access to the building's FTTH network, access will be proposed at a sharing point upper in the network, via an active or a passive offer;

- the publication of such an access offer by the first operator to be present in a building detailing conditions for installing a fibre optic or a sharing point, conditions regarding access to dedicated or shared fibre optic lines, conditions regarding access to all associated resources (see Annex 3);

- the obligation for the first operator present in a building to inform about buildings concerned by fibre optic deployments and relative sharing access point;

- obligation regarding tariffs: tariffs must be "reasonable" and non discriminatory and integrate the investment effort made by the operator.

Impact of regulatory decisions on players' strategy

At the beginning of 2010, a few days after ARCEP's announcement regarding definition of the 3 zones and clarification of rules in Zone 1, France Telecom and SFR announced their intention to partner in order to launch trials in cities in Zone 2 in order to evaluate the technical and economical characteristics for co-investment in such areas. Two cities are already concerned by these trials, Palaiseau and Bondy. The agreement is planned for a 5 year period which is renewable.

A third player, Free, has also announced its intention to launch such a trial in partnership with France Telecom and SFR in Longjumeau.

Thanks to those partnerships, only one operator will deploy FTTH then it will open its infrastructure to the two others in order to allow them to also provide services to end users. The objective is really to reduce investment and civil works for everyone.

Involved operators have already announced that if those partnerships are promising they will be extended to other towns and regions than Parisian surrounds.

A part from these specific partnerships in Zone 2, France Telecom is going to invest in other towns of Zone 2 during 2010 (Brest, Dijon, Le Havre, Pau, Reims, Valenciennes). In Zone 3, France Telecom is ready to conclude agreements with local authorities in order to enhance fibre optic deployment and will mainly propose first, and according to the regulation environment, FTTN+VDSL solutions. France Telecom's final objective is to be present in all metropolitan areas (representing 45 agglomerations) by 2012, then in all metropolitan department and three Overseas departments by 2015.

All theses declarations confirm that recent decisions from ARCEP and Government might indeed enhance private investments as soon as public players can play a role and help completing coverage

3. United States: local authorities and supplementary operators

3.1. FTTH and VDSL gaining ground in the United States

As of mid-2009, there were close to 6.4 million FTTx subscribers in the United States, of which 4.8 million via FTTH. In terms of subscriber numbers, this puts the US in third spot, behind Japan and South Korea, or in 4th spot if we factor in China Telecom's FTTx +LAN/VDSL subscribers in China.

The FTTx market is still growing at a healthy clip in the States: at a rate of close to 27% in the first half of 2009, which confirms that that market's top two players, AT&T and Verizon, continue to attract new subscribers and are becoming serious contenders for cable companies, although not yet threatening their dominant position.

Figure 37: FTTx subscriber growth in the United States, 2007-2009
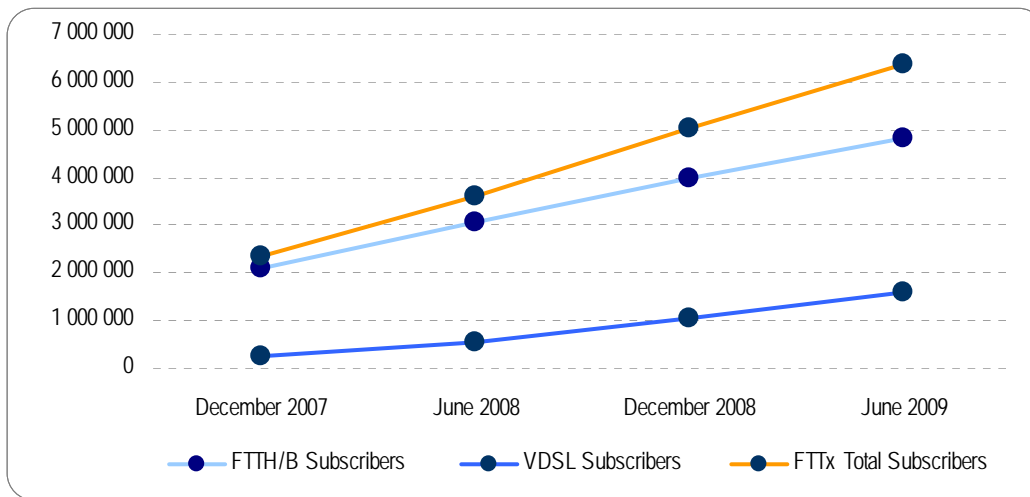
Source: IDATE

Taken separately, AT&T and Verizon have not adopted the same ultra-fast broadband strategies, with AT&T banking on VDSL and Verizon on FTTH/B. Their subscriber numbers grew by 52% and 25%, respectively, during the first half of the year, which are among the highest growth rates anywhere in the world: only KT and Chunghwa Telecom rivalled them, with +43% and +25%, respectively, between December 2008 and June 2009.

The increase in AT&T's VDSL customer numbers offers proof of the technology's growing popularity with users: it now accounts for close to 25% of the country's FTTx subscriber base, while FTTH/B still accounts for relatively few customers, only 6% of the total base –below the global average, but above what we find in Europe.

3.2. Regulations

Under pressure from the RBOCs and the courts, since 2005, the FCC has deregulated the market for VHB Internet over optical fibre.

The FCC is actually requesting telecom operators to supply a solution to sell or lease their networks to competitors in an aim to boost free competition, but only for services on the telephone network and not the Internet network. Telecom operators are thus supplying solutions for unbundling the local copper loop, but there is no obligation concerning optical fibre.

The aim of relaxing the regulations is to allow the RBOCs to compete more effectively with cable operators. The regulatory constraints governing infrastructure sharing are often challenged as curbing investment by operators, who do not want to be the sole party to bear the investment which would, in part, benefit other players.

However, operators that deploy optical fibre are free to commercialise services to other operators and Verizon offers wholesale solutions for its fibre optic networks.

3.3. Local authorities' FTTH projects in the United States

As seen, at end 2009, the FTTx market in the United States is mainly controlled by the RBOCs AT&T and, in particular Verizon.

However, with the take-off of VHB networks in the United States, a number of public players (municipalities, utilities distributors controlled by public authorities, etc.) grasped the fact that having a fibre optic network covering their territories would become as essential as having an efficient electricity, water, gas or sanitation network.

In 1999, these players thus set out to install fibre optic networks based on different models, primarily in territories where purely private operators were unlikely to extend their networks due to insufficient profitability.

In March 2008, the US FTTH Council identified 44 public suppliers operating FTTH networks in 60 cities in North America, accounting for 4% of the total market for FTTH subscribers, rising to 11% of the FTTH subscriber market if we exclude the RBOCs' share of this market.

3.4. National Plan

The National Broadband Plan American (Broadband stimulus), whose contours were defined in late 2009, aims to provides100 million households with an access to 50 Mbps in 2015 and through access to 100 Mbps in 2020. This national program is focusing on rural areas. Several agencies are responsible for defining the conditions for awarding grants;

Figure 38: FTTH market by type of player in the United States
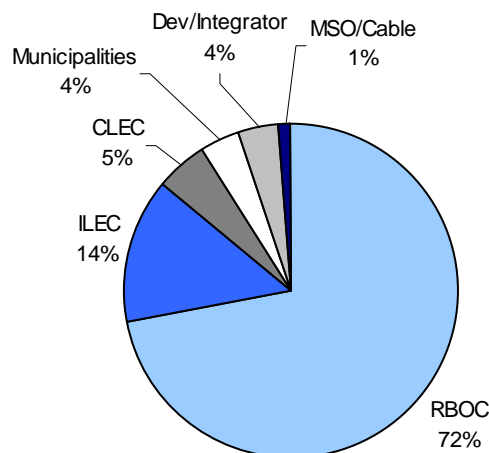
Source: FTTH Council US

Local authorities and local operators use a variety of technologies for their FTTH networks. PON (mostly GPON, BPON or EPON networks) and EP2P networks are deployed, the latter usually being preferred in rural areas, where space-saving is not a major issue and where civil engineering costs are lower (particularly because of the opportunities for overhead deployment).

While earlier projects by municipalities were more modest in size (fewer than 5 000 subscribers), they are now growing, and some major cities such as Seattle, San Francisco, Portland and St Paul are also starting to look at the possibilities in this area.

So far, most of the FTTH networks controlled by municipalities have proved quite successful, especially in terms of the ratio between the number of households taking out subscriptions and the number of homes that are covered.

According to the FTTH Council, the take-up rate is 54% for municipal networks, compared with 35% for RBOCs and 29% for CLECs in rival areas.

The factors motivating local authorities to invest in FTTx networks are relatively traditional and mainly involve:

- making their territories more competitive and appealing to companies seeking to set up sites;

- encouraging home-based businesses, by offering a VHB network;

- improving the productivity and internal operation of the local authority, which can use the network to perform its regalian tasks more effectively;

- resolutely embarking on a course for sustainable development, by developing a "green" technology that helps reduce pollution and other harmful effects caused by travel (especially via tele-working);

- finally, improving the quality of life for citizens.

It is interesting here to study some of the more significant projects conducted by local authorities in the United States, which implement different solutions depending on the case.

Figure 39: FTTH networks implemented in March 2008 by municipalities in North America

North American Municipal Systems Currently Serving Customers with Fiber to the Home – March 2008

SYSTEMS SERVING LARGE PERCENTAGE OF SERVICE AREA (30)

1	Baldwin, WI
2	Barnsville MN
3	Bellevue, IA
4	Bristol TN
5	Bristol VA
6	Brookings, SD
7	Burlington VT
8	Chelan PUD WA
9	Clarksville TN
10	Crawfordsville IN
11	Dalton GA
12	Douglas County PUD WA
13	Gainesville FL
14	Grant County PUD WA
15	Jackson TN
16	Kutztown PA
17	Lenowisco VA
18	Loma Linda CA
19	MINET OR
20	Morristown TN
21	North Kansas City MO
22	Phillipi WV
23	Provo UT
24	Pulaski TN
25	Quincy FL
26	Reedsburg WI
27	Rochelle, IL
28	Sallisaw OK
29	UTOPIA UT
30	Windom MN

SYSTEMS SERVING TRIAL AREAS, OR JUST STARTING SERVICE (14)

1	Ashland OR
2	Auburn IN
3	Cedar Falls IA
4	Clallum PUD WA
5	CMON BC
6	Holland MI
7	Mason County PUD WA
8	Pend Oreille PUD WA
9	Radium Hot Springs BC
10	Shawano WI
11	Spenser IA
12	Sylacauga AL
13	Taunton MA
14	Wilson NC

Source: FTTH Council US

UTOPIA

The Utah Telecommunication Open Infrastructure Agency (UTOPIA) unites 16 cities in Utah that have implemented the MetroNet fibre optic network, targeting people and companies located across their territories.

MetroNet is a public network open to all service providers able to offer broadband access for the Internet, high-definition TV, VOD, telephone services, on-line training, telemedicine and videoconferencing. The business model is similar to those of Open Access Networks in Sweden.

Three main objectives were initially set by the project's promoters:

- shake up competition via a network that is open to all operators and thus likely to break up monopolies;
- reduce the digital divide by developing a network that performs as well as those in major cities;
- offer a secure network, with excellent service quality and wide availability.

On the technical side, the network uses the MPLS protocol with a level 2 architectures.

The required investment was evaluated at about 340 million USD, to cover the first eleven cities.

Figure 40: Cities involved in the UTOPIA MetroNet network
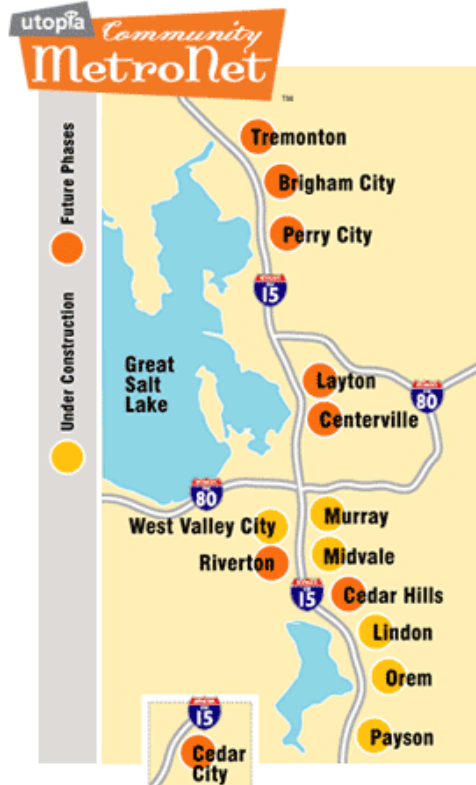
Source: UTOPIA

Grant County Public Utilities District, Washington

Grant County in the State of Washington had no advanced telecommunications services for its very disperse rural population (with fewer than 28 inhabitants per square mile), before the Grant County Public Utilities District (GCPUD) decided to deploy an FTTH network in 2005. It chose the carriers' carrier business model.

Today, this network is used by over twenty service providers and covers more than 11 000 homes and businesses.

City of Bristol, Virginia

Bristol Virginia Utilities (BVU) is the City of Bristol's strong arm for the supply of electricity and water and management of the sanitation system. However, in addition to these traditional activities, in 1999 BVU installed an FTTH network covering more than 16 000 homes and businesses in Bristol as well as the counties of Washington, Smyth, Tazewell, Russell, Buchanan, Dickenson and Wythe.

The network, called OptiNet, combines BPON and GPON technologies, comprising 350 miles on the backbone part, while the optical access network accounts for some 450 miles.

There are now around 8 000 residential subscribers who can enjoy triple-play services (6 Mbps/256 Kbps access for 39.56 USD) and more than 1 200 business subscribers with Internet speeds of up to 50 Mbps, together with *LAN to LAN* links of up to 1 Gbps.

Since its business model is based exclusively on supplying services to end customers, OptiNet competes directly with private cable operators and operators present in the territory. Appeals were lodged by the local cable operator and then the telecom operator against BVU, challenging the legality of BVU's provision of television services, and even denouncing what was perceived as cross-funding between BVU's traditional business and its telecom activity.

These appeals were all eventually thrown out by the courts and the project has proved very successful with resounding positive repercussions on the local economy: according to local players, the presence of the FTTH network has brought new business to the area, including companies like Northrop Grumman and CGI, creating 1 200 new jobs, with more than 50 million USD of additional private investment, and generating 37 million USD from taxes and charges per year.

City of Powell, Wyoming

The City of Powell in Wyoming is located 75 miles east of Yellowstone National Park and has about 5 500 inhabitants. In 1996, it decided to become a Digital City in an aim to establish its development for future years.

The first stage involved investing in a fibre optic network serving strategic business parks and to connect the infrastructure to the regional and transcontinental network of the telecom operator, TCT, present in neighbouring cities such as Cody and Ten Sleep.

Ten years later, the City decided to develop an FTTH network, choosing not to be the services operator itself, deeming that the financial cost to tax payers would be much too high and that such an activity well exceeded their core competence.

A public private partnership was thus established between the City of Powell, the telecom operator and service provider, TCT, and the American company, MetroNets, positioned as a broadband open networks facilitator.

The network would be funded via a bond issue by the City which would, in turn, be the owner. TCT would hold the exclusive rights to sell triple-play services via the network for a period of six years, in exchange for which it would pay a fee to the City, but this fee would not depend on the penetration of services commercialised for the first four years.

Network construction began in 2008, with a GPON architecture implemented by the City to connect all the buildings in its territory. TCT was responsible for activating the network, selecting Calix equipment.

Other projects to deploy local FTTx networks

- Matanuska Telephone Association (an ILEC [6] based in **Arkansas**) began deploying its first networks in 2007. The operator deploys both BPON and GPON networks and offers voice over IP, video and VHB access.

- Liberty Communications, an ILEC in **Iowa**, has planned to invest 7.5 million USD to upgrade its communications networks to FTTH. The project, launched in 2008, uses BPON technology and will be extended to the cities of West Branch and West Liberty. The City of West Branch has 2 188 inhabitants (840 homes) and a population density of 427 inhabitants per km². West Liberty, with a lower population density, has 3 332 inhabitants (1 150 homes), with 825 inhabitants per km².

- BTC, another ILEC in **Iowa**, launched its FTTH project in 2008. It has plans to invest 10 million USD in building an FTTH network in the City of Carrol, serving about 2 000 customers. The city has 10 106 inhabitants (4 173 homes) and a population density of 704 inhabitants per km².

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[6] ILEC: Incumbent Local Exchange Carriers

- Citylink Telecommunications (a CLEC based in **New Mexico**) decided to deploy a neutral Open Access Network. The project was launched in 2008. It offers 50 Mbps symmetric speed for 70 USD a month and 100 Mbps for 130 USD a month, to which installation costs must be added. This new FTTH network uses Active Ethernet technology provided by the manufacturer Occam Networks. The voice service was planned to arrive in 2008, and tests are being conducted on video. At end-June 2008, 150 new apartments were connected in the centre of Albuquerque and projects to extend the network to a large part of the city centre are under way, representing a potential customer base of several tens of thousands of residents. This city has 448 607 inhabitants, a population density of 1 080 inhabitants per km² and 183 236 homes.

4. Asia: appealing to local players but dominated by private operators

Over the next few years, Asia Pacific is and will remain the most active market for FTTx deployments and in particular in FTTH/B

Table 8: FTTx subscribers per geographic zone end 2009

	FTTH/B	VDSL	FTTLA	FTTx+LAN	Total FTTx
Western Europe	2 048 900	1 733 200	31 000	0	3 813 100
Eastern & Central Europe	3 552 335	39 850	0	180 000	3 772 185
North America	5 706 500	3 200 000	0	0	8 906 500
Latin America	5 500	0	0	0	5 500
Asia	29 593 300	3 500	0	17 100 000	46 696 800
Middle East & Africa	173 322	20 000	0	0	88 322
TOTAL World	41 083 357	4 996 550	31 000	17 280 000	63 285 907

Source : IDATE

This switch to very high broadband depends on several criteria, particularly the strategies adopted by operators, who have invested massively in recent years and will continue to do so. Population density and the ratio of urban zones are also catalysts for FTTH/B development.

So far, local authorities have had little involvement in the investments made in this area. However, specific state programmes affiliated with local initiatives help provide some support for operator investment, either focusing on the services available or more generally on activities to structure urban and territorial development, as is the case in South Korea.

4.1. South Korea

The FTTx market

South Korea, like Japan, is a pioneer in very high broadband. 2003 saw the start of a gradual migration of ADSL subscribers to VDSL. At end-2009, 9.2 million users subscribed to FTTH/B solutions, out of a total of 16 million connected households. 90% of homes in South Korea have access to FTTH/B solutions and FTTB architecture now seems to dominate the South Korean market.

The substantial development of FTTx in South Korea can mainly be explained by its high population density, a large share of which resides in urban areas (81% of the population), and by the presence of numerous MDUs and favourable government programmes.

With public authorities encouraging the population to acquire computers, South Korea is now one of the most well-equipped countries.

Also, projects like u-Korea have helped and motivated operators to roll out fibre optic networks. The BCN initiative (Broadband Convergence Network), launched by the MIC, has made FTTH access the preferred VHB solution, gradually encouraging operators to migrate their FTTB solutions to FTTH.

Among the measures recommended by the MIC, operators are required to pay 1% (previously 5%) of their revenues to promote telecom.

Another important measure was the government's decision in 1999 to launch a building-certification programme to promote the deployment of VHB networks. 5 505 buildings containing a total 3.2 million homes have thus been certified since 1999. This programme covers buildings with more than 20 homes and a surface area of over 3 300 m². There are four grades of certification: Special, First, Second and Third Class. The Government recommends the installation of networks that are 100% fibre for Special Class buildings, allowing speeds of up to 1 Gbps. For First Class buildings, hybrid fibre optic networks are recommended and then category 5[E] cable for the end connection. This type of network can reach speeds of 100 Mbps.

Table 9: Programme for certifying buildings in South Korea

Grade	Special	1st	2nd	3rd
Cable to the Home	Fiber	Fiber+Cat5e	Cat5e	Cat3
Maximum Speed	1Gbps~	100Mbps~	10~100Mbps	10Mbps
Emblem				

Source: South Korean Government

The three South Korean operators involved with FTTH/B, KT, SK Broadband and LG PowerCom, each have FTTx market shares of 50%, 33% and 17% respectively. It might thus legitimately be deduced that public authorities' involvement in investments in FTTH/B infrastructures is relatively low and possibly even inexistent.

One specific feature of both the South Korean and Japanese markets compared with Europe and the United States is the high ratio of the population living in vertical dwellings. A little over half of South Korea's population lives in MDUs in major cities, a situation that favours the development of VHB access solutions, and this trend should pick up momentum in future years.

4.1.1.　U-Cities projects

With the arrival of new services in areas such as traffic management, health, administration, personal services, etc., the concept of a U-City has gradually emerged in recent months. These projects are the result of local, public and private initiatives. The South Korean Government, manufacturers and research institutes have signed up to these innovative, electronic communication services programmes.

There are now some sixty new city and e-district projects, uniting a large number of different players: civil engineers, real-estate developers, equipment manufacturers, telecom operators, local authorities and software and computing companies, etc.

The Government has invested about 400 million EUR in these 60 projects. The Ministry of Information and Communication is responsible for overseeing the projects in an aim to simplify procedures and set up a reference model for projects eligible to receive subsidies. The ultimate goal is to produce a model that can be reproduced easily from one local authority to another.

Except for the City of Gwanju, rather than investing in the fibre optic network for the U-Cities projects, local authorities are adopting more the role of facilitator and advisor.

It is worthwhile presenting here some of the existing projects that both demonstrate the involvement of local authorities and the importance of their actions in consolidating VHB investment.

The Kwangju City of Light project

This project is being led jointly by telecom operators (particularly Korea Telecom) and the Kwangju City Council, which has partly funded the fibre optic network.

The total budget is estimated at 72 million EUR, 36 million EUR of which are funded by the Government, 12 million EUR by the City Council and the remaining 24 million EUR by private companies.

The project, planned to last five years (from 2005 to 2009), aims to connect 20 000 homes.

The City of Busan energised by U-City services

Launched by the City in 2005, in partnership with the Government and Korea Telecom, the U-City project, called Busan Metropolitan City, aims to transform this port city in the south east as a true Hub City by 2010. It is the country's second major conurbation.

A fibre optic "information highway" stretching more than 900 km was installed in 2007, at a cost of more than 35 million EUR. It links Busan City Council to more than 250 buildings throughout the region. This infrastructure was the result of a public private partnership.

More than 100 million EUR will be invested between now and 2012 in the five priority sectors:

- U-Port: creation of an information portal for manufacturers and installation of a system for the port's logistics;
- U-Traffic: management of flows and traffic in the city, including its waterways;
- U-Health;
- U-Tour and Convention;
- U-Prevention for disasters; in progress on the major Gwangan Bridge.

This U-City project is already affecting the daily life of citizens. The seats of tour buses are fitted with touch-sensitive screens and provide information in several languages. Tourist sites have RFID terminals that are compatible with cell phones or a U-Terminal, providing information on the site and its surrounding area. 1 300 RFID U-Terminals throughout the city play video clips of films for users approaching the terminal. They can listen to music at the foot of a statue of a local singer, or at a site where an event will take place, etc.

The international technology fair was held in Busan in June 2007. Guests arriving wearing special badges were welcomed by LCD panels displaying a personalised welcome message. Paper catalogues were replaced by videos, etc. This technology helped the city win the competition to host the Lions Club International Convention in 2012.

New Songo City – NSC – and its U-New Town project

This project appears to be the most ambitious in South Korea. Located near Incheon, lying 65 km to the south west of Seoul, NSC was built on a polder by the American developer, Gale International, and the South Korean group, Posco. The City is also highly involved in the project with its urbanisation of the polder.

The total investment for this project is 15 billion EUR, on a site covering 600 ha which will eventually house 50 buildings and 175 000 employees. The residential area will cover 330 ha and house 22 000 homes.

The operator LG CNS was chosen as the main contractor to deploy NSC's telecommunications network; 800 million EUR will be invested between now and 2014.

Incheon City Council signed an MOU with a consortium uniting LG NSC, IBM Korea and SK Telecom to build a U-City Control Centre. This will be the nerve centre for NSC's entire futuristic network, including telecommunications, traffic management, radio identification and surveillance.

In addition to the innovative services offered by the various partners, numerous e-applications will also be offered to residents: remote diagnoses and results of blood tests, RFID tags and smart cards for monitoring road traffic, freight and residents' travel, etc.

In the Incheon Special Economic Zone – ISEZ –, a demonstration of robots connected to the optical network was planned at the NSC's inauguration in August 2008.

Experiments with robots are planned in the city to help support the connected robots industry, including in the areas of e-health and e-training. And robots will move around the shopping centre offering varying assistance to visitors.

In cooperation with CJ Cablenet, SK Telecom has finalised deployment of its mobile television network, offering more than 100 channels accessible on a conventional phone.

Seoul's Digital Media City - DMC

This 1.5 billion EUR project is run and financed by Seoul's City Council.

Its prime objective is to redevelop Seoul's former municipal tip and transform part of this area into a technology park with a multimedia and interactive content theme. Backed by Kotra (a South Korean DIACT[7]), the MIC, Seoul City Council and several South Korean research institutes, DMC aims to unite some 2 000 companies and create 150 000 jobs.

The wireless and optical VHB network will enable users to view content in the street, find their whereabouts in the local area via a GIS and access broadband Internet anywhere, any time, by developing the true concept of a "Media Street".

4.1.2. Summary of factors affecting local authorities' involvement

Double-digit growth in the number of FTTH/FTTB subscribers is strongly linked to the dense population (mainly situated in fifteen or so urban areas in South Korea) and the presence of numerous MDUs.

However, as seen in the above examples, the U-Cities projects involve much more direct intervention by local authorities, which play an important role in urban renovation and the creation of new innovative districts, an area which is directly in line with their fields of competence. These initiatives enable them to enhance the services provided to citizens using an approach that relies on the presence of VHB optical networks. These innovative projects require both FTTH/FTTB access and the presence of urban wireless networks, which play a supplementary role, and are thus fully in line with the notion of ubiquity, illustrating an environment in which everyone can have access to the Internet and other services, any time, any place.

4.2. Japan

The FTTH/B market

In 2009, Japan had more than 17.1 million FTTH/FTTB subscribers, making it the region's leading country in terms of penetration.

The operator NTT has invested massively in optical fibre and clearly dominates the FTTH/B market, with a nearly 75% share.

Japan's model is different from the US one. A distinction can be made between Internet access providers (IAPs) and Internet service providers (ISPs). Most service providers like ASAHI Net are not present in the services market; they do not control the physical part of the network.

Operators such as NTT and KDDI are positioned as IAPs in the sense that they supply access to the network infrastructure and equipment required. But they are also present in the services market.

Users therefore first sign up with an operator for access, and then with a service provider for Internet, telephone and even television solutions. We also see that KDDI may offer services to NTT's Internet customers, and that NTT commercialises its services under the name of its subsidiary OCN. This constraint mainly aims to re-establish the market shares between NTT and its competitors.

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[7] Interministry delegation for the installation and competitiveness of territories

Figure 41: NTT's annual investment in FTTH/B

(JPY) – (financial year)
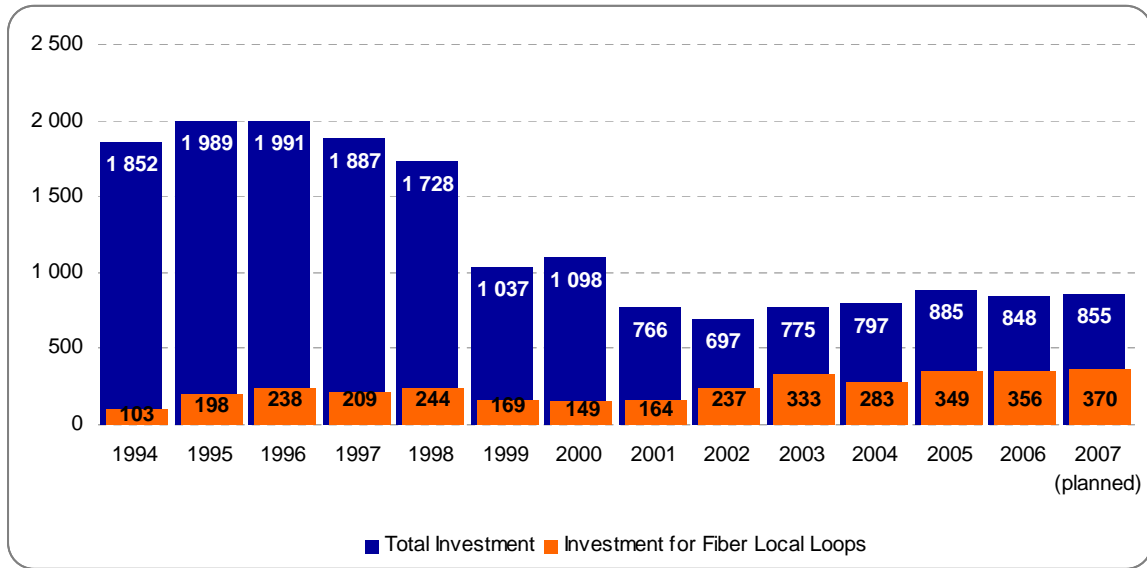
Source: MIC

Government intervention in very high broadband

In order to help deploy FTTH, the Government has taken several swingeing measures:

- award investment subsidies for telecommunication operators,
- support regional initiatives,
- promote VHB technologies,
- support think-tank groups,
- publish and communicate any relevant information on the subject.

The positioning of local authorities

Local authorities are permitted to enter into partnership with the private sector for projects to deploy FTTH/B networks.

These partnership commitments are mainly concerned with market studies and assessing demand, as well as promotional measures by spreading the concept of "good practice".

The most appropriate level of intervention seems to be regional, with the involvement of the prefectures of regions, major cities, towns and villages.

The digital divide between major urban centres and rural zones is widening as investment gradually focuses on very high broadband in areas with high population density. Clearly, FTTH will compound this situation, while broadband access via DSL now covers 96% of the population. Yet, as in Europe, broadband access is vital for maintaining population levels in sensitive areas.

Studies are being conducted to precisely identify and target those areas that will be directly affected by this digital divide and to find suitable remedies and solutions during the governmental planning phase. Mobile technology is one of the technical challenges for guaranteeing broadband access to such territories.

A combination of technologies - Wimax, satellite, fibre optics, etc. – should help ensure the development of broadband practice and usage for all of Japan's citizens.

Figure 42: Examples of "combined projects" in Japan
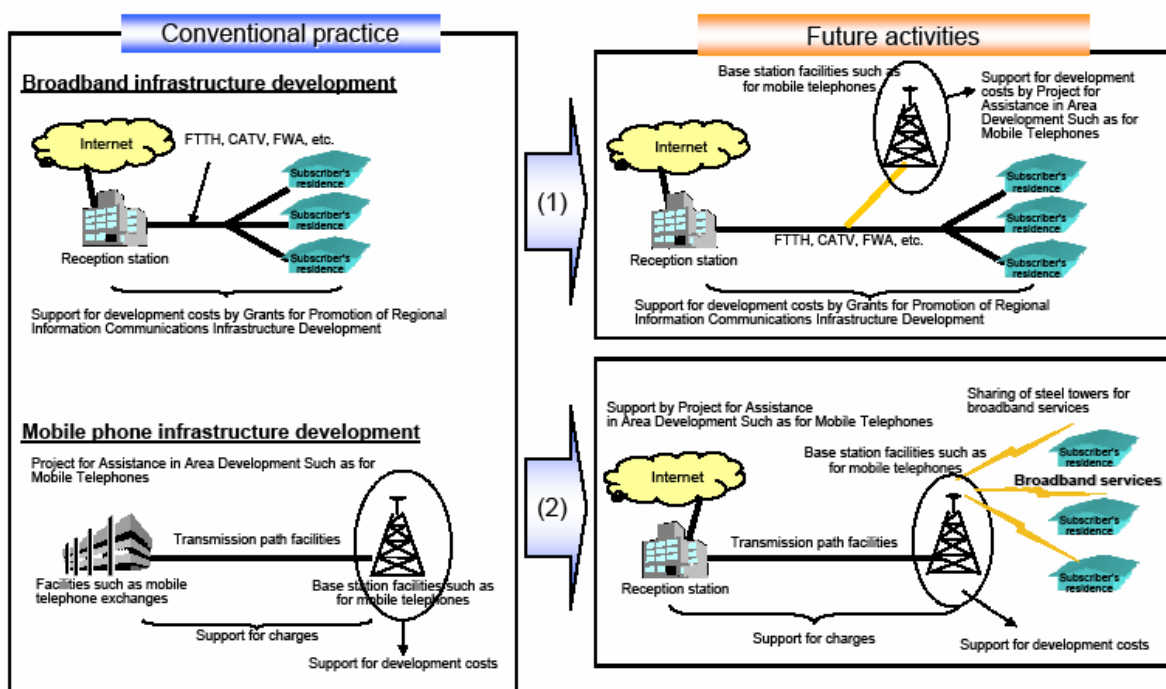
Source: MIC

Summary of factors concerning local authorities' involvement

As in South Korea, the development of FTTH in Japan depends almost entirely on investment by the two main operators, NTT and KDDI.

With 90% of the population passed with FTTH access in 2009, it is understandable why local authorities show little interest in investing in this technology. Especially since the regulator is forcing NTT to open up its networks to third-party operators.

However, operators primarily invest in areas which are densely populated. Local authorities should thus soon be seen investing in the remaining small percentages of the market that are not targeted by these operators.

If we assume that mobility – ubiquity? – will be one of the main issues at stake in future years, it is highly probably that local authorities will be looking to cover all of their territories in order to maintain some form of balance in the market for broadband access. Especially since the Ministry has just granted two Wimax licences to KDDI and Wilcom in an attempt to offset the supremacy of the incumbent operator, NTT.

In a country where population is so concentrated (32% lives on 4.5% of the territory), with most inhabitants living in multiple dwelling units, the deployment of FTTH/B access is more favourable than in most other countries (in Europe and the United States in particular).

4.3. National Fiber Plan in Asia Pacific

The goal here is not to detail the National Fibre Plans running at the moment in the Asia Pacific as we decided here to focus on actions promoted by Local Authorities for FTTH. Nevertheless we are listing here major national initiatives in the region.

Australia

Australia is one of the first countries to set a real national FTTH plan. The NBN program aims to prevent a Fibre digital divide in the country. The plan is to ensure, through the NBN Company, the deployment of FTTH to 90% of households to provide 100 Mbps access as of 2017. The remaining 10% will in turn served by other technologies, including wireless or Satellite technologies. Tasmania is the first area affected by this program (early 2010).

New Zealand

In autumn 2009, the New Zealand government has announced plans to invest EUR 653 million as part of its Ultra Fast Broadband. The program's objective is that 75% of the population has access to Fiber in 2020. For this, a specific company, Crown Fiber Holdings, has been created and will ensure the consistency of deployments throughout the territory.

5. Summary
5.1. Principal methods used for local authorities' intervention

As seen earlier, some local authorities are implementing ambitious FTTH/B network projects, positioning themselves either directly or within a delegated form of management, as a true carriers' carrier or even as a service operator for end users.

However, there are differing levels of intervention by local authorities and, without necessarily going as far as the true role of operator, they do have real room for manoeuvre for promoting the development of FTTH/B networks across their territories. In particular, we can define three growing areas of intervention by local authorities, acting as:

- public domain administrators;
- developer-contractors of the territory by implementing civil engineering infrastructures;
- FTTH/B network operators.

5.1.1. Local authorities as public domain administrators

Some local authorities prefer not to be directly involved in deploying FTTH/B infrastructures, considering the risks to be too high (especially financially), and such intervention to be outside their core business.

But they can still play an important role through their influence as administrators of the public domain of streets and roads: by granting permission to the different network managers to occupy this public domain, they theoretically have excellent knowledge of the subterranean infrastructures in place. They are thus able to coordinate civil engineering among the different players involved to encourage infrastructure sharing: in addition to minimising the disturbance caused to the public domain of streets and roads and local residents, such coordination is likely to substantially minimise the civil engineering costs for operators, as well as encourage the development of very high broadband across the territory.

Some local authorities have gone further by signing agreements with as many operators as possible to systematically anticipate the laying of reserve sheathing when a given operator carries out civil engineering work to install its network.

In addition to encouraging infrastructure sharing, a local authority may substantially speed up the deployment of FTTH/B networks across its territory by allowing, in the rules and regulations governing its street and road system, less intrusive civil engineering techniques (micro-trenching, also called low-depth trenching, groove trenches, etc.). These can considerably reduce civil engineering costs and allow swifter deployment, allowing lines typically between 300 and 500 metres to be installed every day, compared with several dozen metres using more traditional techniques. Several companies have also developed new processes, which involves using a robot to install sheathing that houses an optical cable in a non-accessible sanitation or storm-drain system, for use with conduits with a diameter of more than 300 mm.

Figure 43: Main advantages of micro-trenching

Source: IDATE

5.1.2.   Local authorities as developer-contractors of the territory

Beyond their role as administrators of streets and roads, some local authorities are opting to position themselves as developer-contractors of the territory by implementing civil engineering infrastructures intended to support telecommunications networks.

Once the civil engineering works have been undertaken, the local authority systematically lays the sheathing which can subsequently be used to install a FTTH/B network. Operators wishing to access this sheathing must sign agreements with the relevant local authority in order to acquire the right to use them.

Similarly, development of the territory also requires the systematic installation of sheathing and pull boxes for new business parks. This encourages the development of a competitive FTTH/B solution designed for companies and individuals planning to settle in the area.

In order to fully respond to future requirements, there must of course be some prior agreement that all works deployed are standardised to ensure optimum coverage of the particular authority's territory. Furthermore, such an "opportunist" move to install reserve sheathing when road works are carried out, if necessary, is still not sufficient to provide FTTH to the whole community: we believe that if a municipality only installs sheathing during excavation work on streets and roads, only about 10% of the total FTTH cabling required (and sometimes only on short sections) will have been laid after ten years.

5.1.3.   Local authorities, major players FTTH/B deployment

The third type of positioning a local authority may take up in the development of very high broadband is much more interventionist than the previous two examples. Here, we consider the local authority to be responsible for deploying an ambitious, global network across its territory, either directly, via a partly state-owned entity, such as a utilities distributor, or even by delegating the management to a specialist in the sector.

In this scenario, the local authority, its assignee or the partly state-owned entity generally plays the role of carriers' carrier, investing in the infrastructure, without directly supplying services to end users. The services are commercialised to other operators and/or service providers who are the ones directly in contact with users.

Several local authorities in Europe have chosen this strategy, although some have faced contradicting decisions by the European Commission, as seen in the examples of Amsterdam and Appingedam.

Certain setbacks and risks must however be addressed by local authorities undertaking such projects:

➡ how do they find the right mark between intervening solely in areas with low population density, where operators will not go and where there is no potential for profitability, and intervening in denser areas to offset the non-profitable areas with the profitable ones, areas where they risk competing head on with private operators investing in the same territory, and hence possible legal action over the distortion of competition?

➡ how do they deal with the lack of reactivity inherent in local authorities, due to their modus operandi, and particularly the constraints of having to observe the procedures for public contracts, compared with the more flexible operation of private operators, which can decide from one day to the next to provide coverage to a given area that the local authority has already drawn up plans to cover?

➡ how can they make the right technological decisions in what are still relatively new markets: beyond the issues of network architecture (point-to-point versus PON), should they opt for open access networks like those in Sweden, or for purely passive networks which only require the provision of dark fibre, as seems to be the choice of major operators now in France?

➡ how can they free up the substantial financial means needed to provide a territory with FTTH/B with investment five to ten times greater than that permitted for implementing a gathering network connecting specific points that are limited in number, when authorities also have to perform their regalian public service missions: education, health and welfare, transport, road systems, urban planning, etc.?

➡ how can they fund these projects when tax receipts will fall in future months due to the economic recession and since their traditional partners, financial institutions, are less stable?

The development of FTTH/B networks by local authorities will, in our opinion, be more gradual than previously experienced with utilities gathering systems, and will begin with:

➡ specific extensions of existing gathering systems, to provide FTTH coverage to several thousands of dwellings, particularly social housing units, in areas that are relatively favourable in terms of the investment cost..

➡ an FTTH-specific component, also covering several thousand dwellings in given districts, and included in the region or municipality's new gathering network projects likely to be launched in the coming months.

5.1.4. Varying implications: in practice and in theory

The panorama of FTTH/B deployments shows that varying forms of local authorities have very different approaches from one region in the world to another.

In Europe, local authorities seem to be more interventionist, seeking to compensate for the lack of involvement by private players and to promote their territories by offering new infrastructures and, hence, value-added services.

In Asia, it is primarily the national authorities that have defined global strategies for broadband and very high broadband. They largely anticipated the changing needs by opting to deploy national infrastructures and back innovative services. Some cities stand out today as examples of new digital cities, even though the local authorities themselves did not necessarily initiate such projects. Whatever the case, the success of optical fibre is now unquestionable in Asia Pacific.

Lastly, in the United States, while the first FTTH/B networks were deployed as early 1999 by local authorities or groups of authorities, they now seem to be overshadowed by the presence of the RBOCs, Verizon and AT&T, who have found in optical fibre a solution for competing more effectively with cable operators. However, optical fibre is still perceived as a strategy for enhancing and promoting the territory and some major cities are now considering specific deployments. Local authorities that already have an FTTH/B network in place have positioned themselves in a variety of roles, from carriers' carrier to service provider.

5.2. Main advantages and risks for local authorities

When local authorities decide to get involved in developing very high broadband, it is essential that they consider their strengths and the risks they run before deciding on the precise role they will play. They should particularly face up to competition from many different private players, whether telecom operators, service providers or cable operators.

The table below lists a local authority's main strengths and weaknesses in deploying an FTTx network.

Table 10: Strengths and weaknesses of local authorities

▶ Local authority and FTTx deployment
Strengths
• Identification of citizens in "their" network: citizens of a municipality that deploys its own FTTH/B infrastructure may be more inclined to use it with the feeling that it will best satisfy their needs, that specific services may be offered and that the network creates added value that will directly benefit the territory.
• Knowledge of infrastructures and the subsoil: a local authority's technical department has a particularly rich source of information on how their subterranean systems are used. They are able to coordinate civil engineering work to the maximum and have a clear overview of the infrastructures that can be mobilised.
• Availability of infrastructures that can be mobilised: an authority may itself have available infrastructures, such as the sheathing laid in advance during earlier civil engineering work. Other types of networks (sanitation, storm drainage, electrical, other utilities, etc.) managed either directly or indirectly by a local authority may also be used to accelerate FTTH/B network deployment and reduce the investment required.
• Recurring and inevitable civil engineering work which may offer an opportunity for anticipating fibre optic deployment: each year in France, local authorities overhaul 5 to 10% of their road systems.
• Supervision of the social housing base and close relations with lessors: local authorities have a role to play with real-estate lessors, and particularly social housing landlords, who report to them. This is a great advantage for canvassing potential users of a planned VHB infrastructure and for helping network deployment in multiple dwelling buildings: due to its public service image, the authority might truly be in a better position than a private operator to acquire the agreements required from lessors to install a fibre optic network in buildings.
• Local authorities are not exposed to the same constraints as private operators, in terms of profitability and timeframes for returns on investment: they can, in contrast, fully act out their role as developer-contractor of the territory.
Weaknesses
• Possibility of limited financial means for very high broadband: public players must first fund their regalian activities and hence, it is not always possible to free up enough funds for FTTH/B.
• The current financial crisis will penalise local authorities and their investment projects: the economic recession will mean lower tax receipts for local governments who will find it harder over the coming months to obtain funds from the financial institutions they have traditionally called upon, since they themselves are less stable.
• Some local authorities have limited knowledge of the telecom business and providing FTTH/B services. This may prove insurmountable for some who consider it a duty to perform their core activities as a priority. Even though their involvement may be purely financial, they must still produce detailed specifications to ensure that the service provider offers a high quality service and meets the required objectives.
With this same view in mind, a local player deciding to invest in an infrastructure does not have the necessary resources (financial and human) to operate the network nor even to monitor and supervise the selected service provider.
• The constraints peculiar to public markets penalise local authorities and their need to react quickly, in the face of private operators who are much more flexible.
• Lastly, one of the main weaknesses of local players is linked to competition from private operators: from the moment a given territory is considered as offering high potential, private players are much more inclined to deploy their own networks themselves. This may be perceived negatively by local players seeking to play a more important role in providing services to citizens and having their own infrastructure to do so.

Source: IDATE

All local players wanting to get involved in deploying FTTH/B networks are aware of their strengths and weaknesses. But, more often than not, their involvement is justified by different factors, in most cases to maintain and raise the appeal and competitiveness of their territories, and to compensate for the local dearth of private initiatives.

Fibre optic networks are now considered a differentiating factor for local authorities wishing to draw new businesses to their territories. By extension, optical fibre also presents numerous advantages for individual users and perhaps a means for local authorities to offer innovative services that improve the daily life of citizens.

Even though the services available today differ little from those available on ADSL and cable-modem, FTTH/B networks are permanent and it will be hard to match their performance for some years to come. Deploying an FTTH/B infrastructure is therefore a reasoned gamble on the future and helps local players anticipate the needs to come that will justify the investments, such as encouraging the elderly to stay at home by offering them cheaper health services online rather than building special accommodation.

IV - Innovative services over FTTH/B

1. Introduction

Innovation is central to the strategies of all players operating in media, Internet and telecom markets.

In the world of TV, the annual Consumer Electronic Show (CES) in the United States is the venue of choice for announcements from equipment manufacturers, content providers, broadcasters, etc. One of the focal points at this year's edition was **3D**, buoyed by the global success of the film *Avatar*. For the sector's specialists, the idea is to incorporate 3D into residential solutions to allow each and every consumer to enjoy the technology in the comfort of their own living room.

Another promising solution is the **connected TV** which allows users to do away with intermediary devices, like game consoles and other set-top boxes, by making the TV set Internet-ready and equipped with a browser.

From a technological standpoint, then, we are seeing a steady stream of developments at the device level, but a still substantial portion of consumers will not be able to take advantage of them until network infrastructures are upgraded to be able to supply the bandwidth and symmetrical rates needed to deliver the services. This does not apply only to 3DTV or the connected TV, but to other video-based services as well, such as **residential videoconferencing** on which major players like Cisco and Skype are focusing considerable efforts.

While telcos deploying FTTH networks are devoting themselves mainly to achieving broader coverage, it will very soon become crucial to offer innovative services that cannot, or would be difficult to access using older networks, such as DSL and first generation cable modem systems.

If, for now, developments are coming from players in different sectors, the speed and efficiency with which some of them manage to forge themselves a foothold in new niches will likely have a tremendous impact on the value chain that is just starting to take shape around consumers' future needs.

2. Video/TV market innovations

2.1. 3DTV and the connected TV: highlights of CES 2010

As it does every year, the Consumer Electronic Show (CES) provided the top video equipment manufacturers a chance to unveil their latest innovations. Judging by the success of flat screen TVs and the growing prominence of 3DTV, this event serves to foreshadow what TV in the home will look like a few years down the road.

3D is now a strategic point of focus for all of the sector's leading players (Panasonic, Sony, LG Electronics…), and all have rolled out solutions that allow viewers to watch films in 3D which will be available not only on their TV screens, but also on their computers and mobile phones. To ensure swift and optimal sales of their new 3D screens, equipment manufacturers have forged strategic partnerships with content providers, satellite pay-TV services, production studios…

Meanwhile, several TV networks have already announced their 3D projects. In the United States, sports network ESPN plans on rolling out a 3DTV offer before the summer while, over in the UK, Sky broadcast a sporting match in 3D in January, whetting viewers' appetite for a commercial service that is due to launch in April 2010. And, in France, Canal Plus has been working on a 3D channel for several months now.

Broadcasters and display manufacturers, appear to be sticking to a relatively similar roadmap, laying the groundwork for the smooth arrival of 3D.

Experts believe that this market will begin taking off within two years, and this despite price tags that will remain high and fragmented technological standards. According to early forecasts, some 64 million units of 3D-compatible viewing devices will be sold by 2018 (DisplaySearch).

Figure 44: Proportion of households with a 3D TV set, 2008-2014
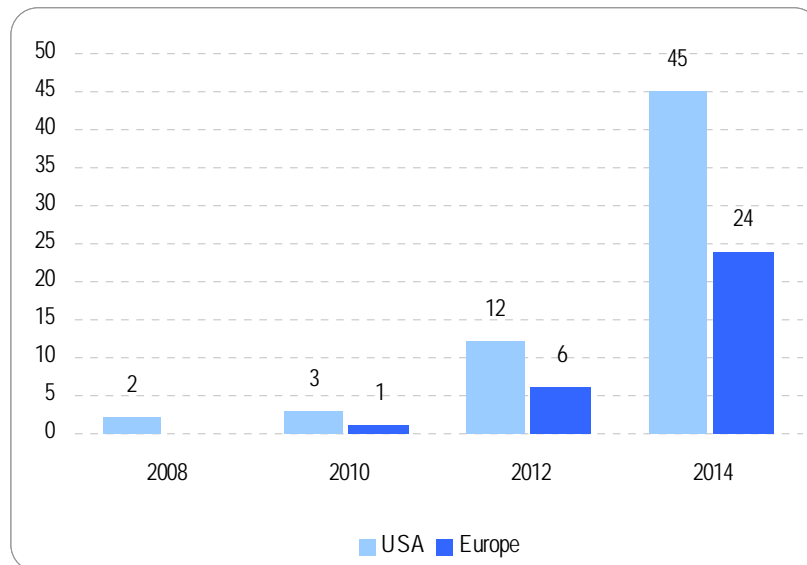
Source: IDATE, based on data from DisplaySearch

Another major innovation that is expected to become very popular with viewers is the connected TV set. Users can already access online content from their television if they install special equipment, usually a dedicated set-top box (Boxee, Roku) or a game console (Microsoft's Xbox, Nintendo's Wii or Sony's PSP3). In most cases, the console makers sign agreements with content providers.

But it will now be possible to access Internet content directly through the set that will be made Internet-ready, equipped with Wi-Fi or Ethernet access capabilities and a Web browser. Here again, we are seeing strategic partnerships being formed between different types of player along the chain, such as:

- LG Electronics and Netflix, which sells video and pay-per-view subscriptions;
- Orange and LG Electronics have signed a three-year partnership under which Orange will develop a dedicated portal that can be accessed from LG screens and intended to provide a complement to classic TV content;

- M6 and Sony, CanaPlay and TLC, TF1 and Samsung: in each of these deals, the connected TV will host the interactive services and content marketed by the broadcaster;

- …

These partnerships will be crucial to increasing the selection of content available to viewers. As it stands, content is centred around a handful of services like news, weather, stock market indexes, etc. and is accessed via interactive widgets[8] and RSS feeds integrated into the TV set. We can expect to see more and more agreements being put into place and expanding into providing direct access to websites (video sites, social networking, etc.).

The connected TV market is a very promising one, and will likely develop very rapidly over the medium term. In the United States, 615,000 connected TV sets were sold in Q2 2009: a 69% increase over the previous quarter.

Figure 45: Growth of the base of connected TVs in the United States, 2008 - 2009
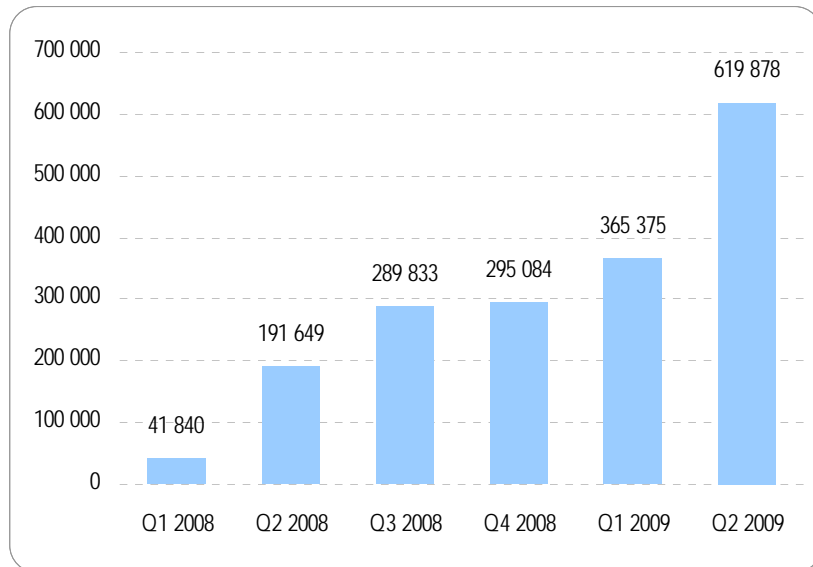
Source: Quixel Research

2.2. Other major innovations in the field of video

Some players are banking as well on communication solutions that also require no other device than the TV set. One case in point is the recent introduction of residential video calling services, a consumer version of videoconferencing solutions used by businesses, such as Cisco's TelePresence.

Whatever the type of player behind it, the approach to these solutions seems to be the same, and based on HDTV screens. Skype is one of the first to announce a video calling product: the provider of VoIP solutions recently announced that that it was working on a communication solution for HDTV screens, in partnership with LG Electronics and Panasonic. The business model would be similar to the Skype IP telephony solution, namely free access to the service.

Equipment manufacturer Cisco is coming at this market from the same angle, having announced at CES 2010 in Las Vegas that it was developing a telepresence solution for the residential market. Cisco has teamed up with American telco Verizon for trials to be carried out in the US, and is expected to sign a similar deal with France Telecom in 2010. Unlike Skype, however, Cisco's solution would be for-pay, with the terms and rates set in tandem with the carriers.

One of the advantages of this type of solution is its compatibility with devices other than the TV, and so making it possible to establish a video call between a TV set and a computer, for instance, or a mobile phone.

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[8] An interactive widget is a tool that it is displayed on-screen and allows users to access information or entertainment content. It is generally superimposed over the programme being watched.

There is no longer any doubt about telcos' interest in video. It has become clear to all of them that video-based services will be the biggest driving forces in the coming years, and the ones that will help them monetize the fibre infrastructure in which major investments have been and will be made. So the overall strategy is to deploy networks to pave the way for innovative services that could not be delivered over existing infrastructure, notably copper networks.

Only a few telcos, such as Verizon in the US, have sought to roll out value-added services with their new FTTH infrastructure. Once it had chosen to become involved in deploying fibre-to-the-home networks, Verizon focused immediately on video solutions, and is among those marketing the most innovative, interactive and complete offers in this area.

The carrier's FiOS TV service is a central part of its strategy, and is continually being enhanced with new features. In addition to the IMG (Interactive Media Guide) – which lets viewers choose a programme by clicking on a picture on-screen, configure the parental control system, perform programme searches, etc. – Verizon has developed an offer that allows users to access the same content using different devices in different locations, and via the Web or over a mobile phone. More recently, the carrier unveiled the latest features to be added to its IMG: customized VoD with a listing of titles in the same genre as the programmes that the customer watches most often, new browsing shortcuts, gaming widgets, ability to purchase of special content (ESPN, Showtime) with the remote control…

Table 11: New features added to Verizon's IMG

Recommendations For You	Allows subscribers to customize the available VoD offers by clicking on the movies in the FiOS TV listing that they have already seen
More Like This	Button that lets users access programmes of the same genre while they are watching a VoD programme
On-Screen Premium Programming Purchasing	Lets viewers use their remote control to buy time-limited subscriptions (for a week, or pay-per-view for certain special events) from the ESPN or Showtime site
Quick Guide TV Options	Shortcuts that gives users access to certain interactive procedures, like parental control, when the programme being aired will rerun, recording, list of programmes similar to the one being watched…
Quick Guide DVR Options	Shortcuts to the DVR for quick access to certain features, like skipping back to the start of the programme, save, help, parental control…
Full Screen Program Information	As its name implies, full-screen viewing of the information on the programme being aired
Reversi Widget, Chinese Checkers Widget	Gaming widgets

Source: IDATE, based on Verizon data

3. FTTH networks, "serving video"

Verizon is one of the few telcos to have developed as broad a video offer as FiOS TV, especially designed for FTTH and which is now one of its flagship products. The carrier was able to monetize the service rather than the network itself, unlike other operators who are using the performance of the infrastructure they have deployed (symmetrical bitrates) as their main selling point, considering that enough of an asset.

As a result, and even though there are other, technically very powerful solutions out there that make it possible to deliver TV and video services, FTTH networks are undeniably the best suited to interactive video offers and/or those that require a great deal of bandwidth.

Interactivity is one of the main points of focus: consumers are more and more inclined to deliver content and to want to access complementary services that either take them beyond being just passive viewers, or to be able to access higher quality pictures (HDTV, 3DTV).

While they are gradually becoming aware of the new possibilities that are opening up, it nevertheless remains that if their network connection is not powerful enough, they will not be able to take advantage of them. So there is no shortage of arguments in favour of FTTH, including:

- first, unprecedented speeds, both upstream and downstream;
- equal quality of service for all subscribers (no bandwidth sharing);
- ability to access services simultaneously (watching different content on different screens, record one programme while viewing another, etc.), which is not the case with DSL networks;
- increased network agility (low latency, although access is not the only factor at play with latency)…

Figure 46: Advantages consumers expect from superfast broadband access (statements)
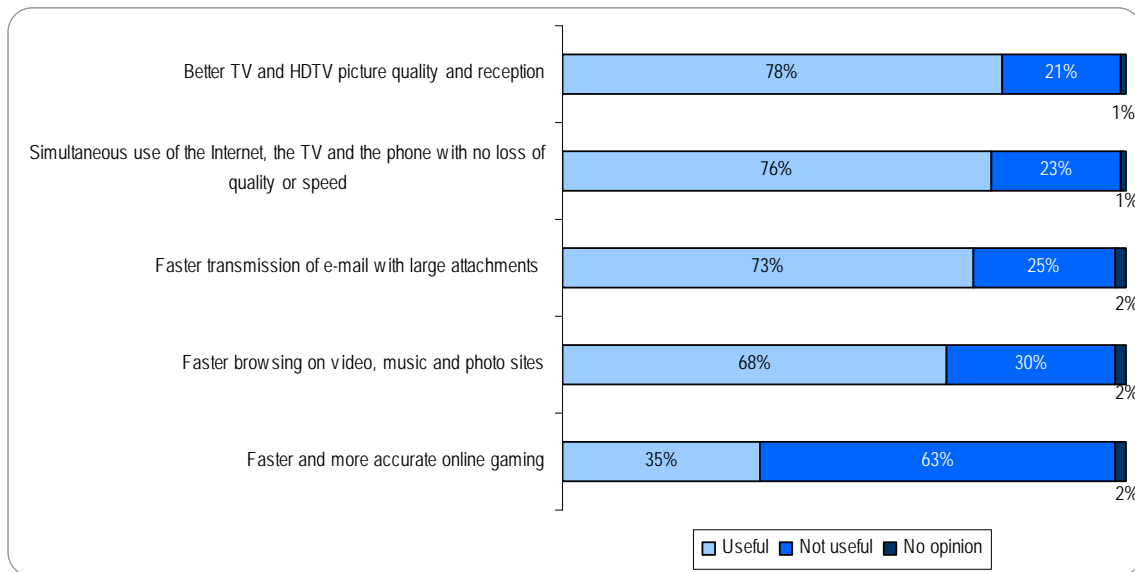
Note: n = 1,000 of which 73% Internet users and 54% who access the Web on a daily basis

Source: TNS-Sofres survey for Numericable, March 2009

Operators are currently involved in FTTH rollouts are still much more focused on the rate of coverage that they will be able to achieve in the short and medium term. For a lot of them, marketing the service is a secondary consideration for now, even if they are fully aware of the need to monetize their infrastructure with services that it would be difficult, if not impossible, to deliver over existing networks, i.e. DSL, cable modem and 3G. But they can only engage in their marketing efforts if these value-added services are actually available and truly operational.

In the coming months, and given the recent announcements from equipment manufacturers (Cisco), software publishers (Skype) and telcos (Verizon), we will likely see a faster rate of development for innovative applications (telepresence, interactive video solutions, teletraining, telemedicine, etc.), which will be a real momentum booster for both the video services market and the superfast broadband access market.

4. IPTV – FTTH/B landscape in Asia Pacific

4.1. South Korea

Until recently, only VOD services were available over telcos' networks in South Korea, because of the pressure from cablecos and terrestrial channels to authorities. In 2008, after the absorption of the Korean Broadcasting Commission (KBC) by the Korean Communications Commission (KCC), convergent digital services have been allowed. Since then, the market is getting structured around "online" video, data and voice service offerings.

For telcos such as KT and SK Broadband, there is a great opportunity to get involved in the video service market and to valorise their fibre optic networks, in a saturated broadband market. By last quarter 2008, 3 operators have been awarded a licence allowing them to provide IPTV services: KT, SK Broadband and LG Dacom. As of end 2009, those three operators combined had 2.4 million IPTV subscribers. Nevertheless, due to the previous regulatory landscape, those players are still hardly competing cablecos which continue to lead the TV service market in South Korea.

Figure 47: Market share of South Korean IPTV players at end 2009
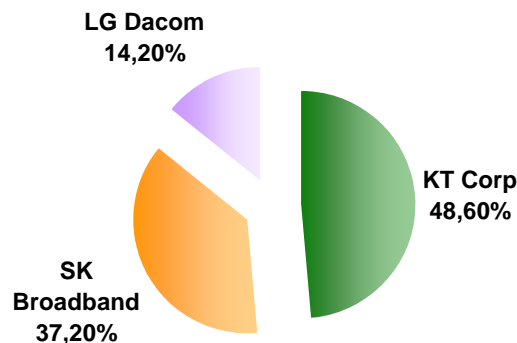
Source: IDATE, based on information from KT Corp

KT Corp

The South Korean incumbent has launched a specific service, named Qook, which includes TV and Internet access. By end 2009, KT reached 1,172 million IPTV subscribers under the Qook brand and it is leading the IPTV market with 48,6% market share.

Its strategy regarding FTTH in general and IPTV in particular is quite aggressive. Indeed, the operator intends to invest EUR 1.5 billion by 2012 dispatched as follows:

- EUR 790 million in infrastructure improvements,
- EUR 400 million in content,
- EUR 300 million in IPTV set top boxes,
- EUR 10 million in research.

A part from that, KT Corp will aim to increase ARPU by providing new value added content services to end users. For instance, one of its objectives is to migrate all of its VOD customers to its Live TV offer.

Table 12: Creation and launch dates of key IPTV and fibre services from KT Corp

August 2009	• KT, in cooperation with Skylife, launches *Qook TV Skylife*, a new hybrid service combining IPTV and digital satellite broadcasting. *Qook* Skylife TV offers 170 channels via Skylife and 65,000 videos on demand through KT's *Qook TV* service. The premium package costs approximately EUR 12 (for a 3-year subscription), the standard package EUR 10, and the economy package EUR 8.
June 2009	• *Mega TV* premium service is launched, offering 80 channels for EUR 13/month.
April 2009	• The *Qook* brand is launched and *Megapass* ADSL Internet access services are renamed *Qook*. The rebranding initiative symbolizes KT's business transformation and the trend toward bundled service offerings (Internet, telephony and television). In addition, the *Qook* brand expresses the fact that users can control and "cook up" their own TV content.
November 2008	• *Mega TV*, a channel package focused on educational, interactive and alternative media services, is launched. This makes KT the first operator to deliver IPTV services in South Korea, with approximately 40 channels and interactive services (including online banking and e-commerce).
December 2008	• At the end of 2008, subscriber growth slows. KT explains that this is partly because the operator stopped offering the first month of subscription service free.
August 2007	• After trials in several cities, KT launches IPTV services. • KT announces it is investing more than EUR 230 million in "last kilometer" upgrades to create a 100% FTTH network.
2006	• FTTH deployment begins.
2001	• FTTH trials.
June 1999	• Launch of *full ADSL* service.

Source: IDATE – market report "IPTV Services", based on information from the operator

Table 13: KT Corp's offerings over FTTH

Service description	Pricing	Additional services and options
50 Mbps access service	EUR 17.30/month without a long-term commitment or EUR 14.80/month with a 3-year commitment	
100 Mbps access service	From EUR 16.70 to EUR 20.85/month	
Qook TV • 100 television channels, including terrestrial channels such as KBS, MBC, SBS, EBS • Educational services: English conversation, elementary courses, Chinese or Japanese courses. • Interactive services: • Games • Search services - ability to search the Web - access to bank accounts - ability to shop (T-commerce) - participation in shows in real time • Sending text messages • Caller number display on the phone • Weather, news • Karaoke • *TV Album* service	EUR 4 to EUR 5/month + set-top box rental	The charge for each additional service is a few euro cents per month up to EUR 20/month • VoD + *Live IPTV*: EUR 5 to EUR 6/month. • SMS • Personality test for children, help in guiding and teaching children • Games • Wallpaper • Stock information
Qook TV VoD • Films • Catch-up TV • Education, sports, etc.	Basic Service: Approximately EUR 9/month Advanced services: Approximately EUR 13/month Rates vary depending on length of commitment, number of channels, etc.	• VoD: From EUR 4 to EUR 5/month
Qook TV Skylife	From EUR 8 to EUR 12/month	

Service description	Pricing	Additional services and options
• 90 to 170 broadcast channels depending on the package selected • VoD		

Source: IDATE – market report "IPTV Services", based on information from the operator

SK Broadband

SK Broadband (initially Hanaro Telecom) is the second largest broadband provider in South Korea in terms of revenue and customer base. SK Broadband offers cable, FTTx, LAN and ADSL services under the *Broad & Internet* brand. SK Broadband offers 100 Mbps through its FTTH Internet access offerings. Its objective is to cover 100% of households with FTTH by 2015.

It is the second largest IPTV player in South Korea with more than 37% market share at end 2009.

Table 14: Creation and launch dates of key IPTV and fibre services from SK Broadband

July 2009	• SK announces that it has selected G-PON technology for its FTTH network.
January 2009	• Launch of IPTV services.
December 2008	• SK Broadband selects Tandberg to deploy its IPTV services.
April 2008	• SK Telecom acquires Hanaro Telecom and renames the Hana TV service *SK Broad & TV*.
November 2007	• Introduction of commercial FTTH service at 100 Mbps.
December 2007	• HanaTV has more than 810,000 customers.
March 2006	• Launch of hybrid FTTH/VDSL service. • Hanaro Telecom acquires CelrunTV, a set-top box manufacturer.
July 2006	• Launch of first *Hana TV* VoD service.
July 2004	• Mass deployment of 100 Mbps fiber network.
January 2002	• Launch of 100 Mbps fiber LAN network.
April 1999	• Launch of first ADSL service in the world.

Source: IDATE – market report "IPTV Services", based on information from the operator

Table 15: KT Corp's offerings over FTTH

Service description	Pricing	Additional services and options
Fiber access service: *Broad & Internet* • 100 Mbps • Email (10 Mbps): • Web page	Price varies with commitment: EUR 16 to EUR 19/month for commitments ranging from 0 to 4 years.	
Broad & TV • VoD	From EUR 6/month to EUR 7/month depending on commitment + set-top box rental ranging from EUR 0/month (with 3-year commitment) to EUR 4/month.	
Broad & Internet + TV	From EUR 5.60/month to EUR 6.70/month depending on commitment + set-top box rental of EUR 4/month.	• Language courses • Arts services • Premium entertainment services
Broad & Internet + Phone +TV	From EUR 5/month to EUR 6/month depending on commitment + set-top box rental ranging from EUR 0/month (with 3-year commitment) to EUR 4/month.	Same as *Broad & Internet +TV*
Broad & IPTV • Television channel broadcasts • VoD • Karaoke		Same as *Broad & Internet +TV*
Broad & Set = Internet + Phone +IPTV (Broad & TV)	EUR 19/month	Same as *Broad & Internet +TV*

Source: IDATE – market report "IPTV Services", based on information from the operator

4.2. Hong Kong

Hong Kong is one of the most developed FTTH/B market in the world, and is, according to OFTA, clearly the leading country in terms of IPTV, with more than half of the households being subscribers of such an offer. One characteristic of Hong Kong is that IPTV is ahead of cable for pay TV services.

The indubitable leading player is incumbent PCCW, which provides the Now TV service and counted already nearly 1 million subscribers by mid-2009.

Hong Kong Broadband Network

HKBN is its main challenger. HKBN's objective in terms of FTTH roll out is to reach 2 million connected households by end 2010, which represents 90% of the population of Hong Kong.

HBKN seeks to differentiate itself from other pay-TV players, particularly its main competitor PCCW, by taking advantage of fibre speeds to offer interactive applications accessible directly from the television set. Moreover, the main area in which HKBN seeks to innovate in the IPTV field is interactive services, which allow operators to differentiate themselves from the competition and thereby attract new customers, build the loyalty of their existing customer base, and increase ARPU. The applications contain pay features that are charged per use, such as looking up stock quotes , sending SMS messages, and downloading content to a mobile phone (ring tones, games, wallpaper, etc).

HKBN is also beginning to develop interactive channels on a subscription basis, such as video games channel *Funspot*.

Table 16: Creation and launch dates of key IPTV and fibre services from HKBN

July 2009	• Introduction of the first HD channel on *BBTV: LUXE.TV.*
November 2008	• Launch of interactive quiz channel Animax Gokujou Taiketsu, which provides fans of Japanese animation a place to test their knowledge and challenge one another and themselves by responding to questions using their remote control. Each month, the player with the highest total score wins a prize (a digital camera, an MP3 player, etc.).
September 2008	• Launch of *Nat Geo Challenge*, an interactive channel offering National Geographic Channel Asia programming and related multiple-choice quizzes. Viewers are invited to participate to win prizes.
June 2008	• Launch of interactive games channel *Funspot*, which offers solo and multi-player games.
January 2008	• Commercial introduction of a dual-mode terminal that is both an HD DTT receiver and an IPTV set-top box.
May 2007	• HKNB's IPTV service is renamed BBTV.
April 2007	• Launch of *BBBox* application that allows multimedia (video, audio and photo) files stored on a PC belonging to the subscriber or another person to be broadcast to a TV. This service offers all the functionality of a VCR: play, pause, fast forward, rewind, etc.
August 2003	• Launch of IPTV offering, available in single-, double- or triple-play. Includes 11 channels, 11 interactive services and the "See You On TV Tonight!" application that allows subscribers to share their own videos on the TV platform.

Source: IDATE – market report "IPTV Services", based on information from the operator

Table 17: HKBN's offerings over FTTH

Service description	Pricing	Additional services and options
BBTV double-play offering: • *BB100*: Very high speed Internet access (up to 100 Mbps download and upload) • *BBTV* TV channel package	• From HKD 139/month (approximately EUR 13) to HKD 169/month (about EUR 16) depending on TV package	• 10 à la carte premium channels (mainly for adults) accessible by subscription and/or PPV. • More than 20 interactive application services (weather, news, stock quotes, online photo albums, email and SMS applications, banking, online shopping, etc.), some free, others pay (all available in the extended basic TV package only). • HD set-top box: HKD 48/month (about EUR 4.5).
BBTV triple-play offering: • Same as double-play offering • Telephone	• HKD 159/month (approximately EUR 15).	• 10 à la carte premium channels (mainly for adults) accessible by subscription and/or PPV. • HD set-top box: HKD 48/month (about EUR 4.5).

4.3. Japan

Surprisingly, Japan is not the most advanced country in terms of IPTV services and/or video services over FTTH. Indeed, the regulatory landscape is still constraining and telcos are not yet allowed to provide video content from existing broadcasting players over their networks. This is applicable to FTTH networks of course so for the moment IPTV is still underdeveloped in the country. Some video services, such as Vod and interactive services might be a bit more developed but this is not the main objective of end users when subscribing to a FTTH access offer.

Nevertheless in a very mature Broadband access market, and as seen in South Korea, law should evolve soon to allow telcos to launch real IPTV services quite soon.

4.4. Example of players' strategy out of Asia Pacific

Taking a look at the current status of IPTV offerings will give us a better picture of the situation with video services based on FTTH networks in other regions than Asia Pacific.

Below are details on the main innovative projects that are already available or have been announced by some of the top international players.

Vendor	Innovative IPTV/FTTx projects
AT&T	On its U-verse service, AT&T offers a range of interactive TV applications and services that can be accessed directly on the television using the remote control. There are more than 20 applications available, of which 12 were rolled out in 2009 alone. They involve a number of themes, and so are aimed at a variety of audiences and viewing habits. Through its IPTV over FTTx service, AT&T also markets an overall digital home solution that includes: • total Home DVR advanced features which let customers watch up to 5 HD programmes simultaneously, including 2 live and 3 time-shifted, to sort their recordings by series, to record up to 4 programmes at a time, to watch up to 4 recorded programmes at once, to pause a recorded programme and pick it up in another room, to watch the same programme in different rooms, independently… • ability to programme the DVR remotely from a computer, a mobile phone or using a dedicated application for the iPhone and iPod touch; • interactive applications that turn the TV into a media centre, allowing users to browse their photos stored online on Flickr and to distribute the photos and music stored on their computer.
Verizon	Verizon is continually adding new features to its offers aimed at movie lovers so that they can access exclusive films anywhere, using any device (PC or TV). TV Everywhere allows telcos like Verizon to deliver premium content to the home, and therefore to compete with over-the-top services like Hulu. Verizon has also beefed up its FiOS TV service with a range of new features (see section 2.2), including a wide range of applications grouped together under the name Widget Bazaar. The carrier is also interested in the multi-screen experience and in fixed-mobile convergence, to ensure that customers can buy or rent content, play games, download… on their TV, their computer and their mobile phone.
Deutsche Telekom	For Deutsche Telekom, innovations for its IPTV offer go chiefly by way of improving and enhancing its My Services interactive platform that can be accessed in multiple ways (PC, TV, mobile). This convergent applications offer allows users to have access to their communication apps and systems, their practical services, personal content, addresses, etc. at all times.
Telefónica	• 3D TV: Telefónica wants to be the first pay-TV provider to offer 3D TV. As HD is becoming increasingly ubiquitous, Telefónica I + D (R&D) has developed a 3D VoD platform. • The carrier is also investing in interactive and customized multi-device advertising: smartphone, TV, etc. • Telefónica is testing a high definition home videoconferencing solution. • The company also wants to incorporate social networking into its TV services. It is already testing the Pinchos service – Pinchos being interactive widgets on the TV set (i.e. interactive applications tied to social networks like Facebook). • Telefónica is also testing a convergent mobile-TV service called Shake & Throw that lets users send photos from their mobile to the television by shaking their phone while pointing it at the set. • The Spanish incumbent has also become aware of the importance of pay-TV, as revealed in its desire to acquire a stake in Digital +. Telefónica could also want to gain control of the pay-TV market to gain control over a larger section of the IPTV value chain.

Vendor	Innovative IPTV/FTTx projects
Free	Free has not yet rolled out any innovative service over fibre, but the French operator is touting the improvements to its existing service that were made possible by superfast access, namely: • multi-set viewing • increased quality of its HD channel offering • faster file uploads on the TV Perso personal video sharing service (up to 50 Mbps upstream over fibre, compared to around 800 kbps over ADSL).
Numéricable	The future innovative IPTV services from French cableco Numericable will likely revolve around its new TV portal called NumeriSphere. This interface could soon be enhanced to include interactive applications, customization and programme recommendation features. The company recently launched a service that brings certain novelties to the French IPTV landscape: its NumeriSearch engine lets users find programmes being aired within the next 7 days on any of the channels the cableco carries and on all of the VoD services.

Source: IDATE market report: "IPTV services: advantages of FTTX. Outstanding issues for operators"