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Analysis of an integrated plan for expanding broadband access in Colombia

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Abstract

Colombian telecommunications exhibit remarkable growth in the mobile sector and television market evolution and some degree of stagnation in fixed telephony and broadband access. Only recently the Colombian government has started to seriously address the need to deploy a plan for rapid and effective broadband growth, adding to the worldwide wave of government planned investments on fibre-optic broadband access expansion. Our paper analyses the current state of the Colombian government's broadband plan, named *Vive Digital*, comparing its proposed actions with the plans and achievements of three OECD countries' experiences on broadband policies. Several aspects, either collectively or individually, from the three international cases are used as guidelines of what an integrated, efficient broadband policy may be. Our analysis takes consideration of the contextual differences between the studied cases for the benefit of identifying the strengths and weaknesses of the Colombian plan, and is focused on the incentive structure needed to advance the development of infrastructure, services, applications and user involvement.

Key words

Broadband access networks; broadband national policy; next-generation access networks; incentive schemes; Colombia's broadband initiative.

1. Introduction

As convergence becomes the leading paradigm for the development and advancement of telecommunications in the world, converged networks and the services provided must rely on diminishing infrastructure costs and reduction of barriers to entry, in combination with vertical disintegration between services and infrastructure. A converged environment must also provide incentives for the cooperation between different players (content providers, network operators and device vendors), giving rise in turn to the creation of new markets for new services and devices. Such is the expectation created by governments around the world that have decided to lay out plans for broadband access expansion. The once paradigmatic belief that markets are better at delivering on network expansion and innovative services has been revised by yet

another paradigm that dictates that it is not markets but direct intervention by governments that will accelerate the construction of broadband access networks (Given, 2010). In a handful of cases governments plan to enter into partnerships with the private sector to get the networks built, devising a plan to gradually pull-out from co-administering the network as revenue is being raised throughout time to recover the invested funds (MED, 2010; APL, 2007).

It is already a widely accepted fact that any modern economy needs to be utterly concerned with the deployment of broadband access for consumers and businesses (Ulrich, 2004; Falch & Henten, 2010; FCC, 2010a; Given, 2010). Using the Colombian context as a case of study this paper is concerned with understanding why and how a government initiative can effectively substitute or complement private investment initiatives in broadband access. We also present the highlights of other national broadband plans in three countries, the Netherlands, South Korea and New Zealand, which help us to point at weaknesses and strengths of the analysed policy. Such analysis will allow us to discuss the mix of policy initiatives that Colombia's Ministry of Information and Communication Technologies (Ministerio TIC) plans to put forward in what has come to be known as the *Vive Digital* plan.

The paper is organized as follows. In section 2 the Colombian telecommunication market state is presented. In section 3 we outline the proposed actions of the Colombian plan and in section 4 the policies stated in the broadband plans of three OECD countries, the Netherlands, South Korea and New Zealand. Section 5 is devoted to an analysis of the Colombian plan vis-à-vis the international experience, and Section 6 concludes.

2. The telecommunications market in Colombia

Colombian telecommunications went through radical changes during the mid-1990s as a liberalization and privatization mood swept through the Latin American economies. Even though Colombia's 1991 Constitution allowed private capitals into the infrastructure sectors, the telecommunications companies were not immediately privatized. Radical opposition to the selling of the National Telecommunications Company, Telecom, in 1993 and the creation of an all new telecommunications market, the cellular telephony market, weighed on both sides of the state asset ownership debate. Eventually in the late 1990s a share of private capital was

injected into the long distance telephony market, which resulted in a new-century telecommunications scenario with a fully private mobile market, and a share of the long distance operation and small local telephone companies in private hands.

As of 2011 the Colombian telecommunications landscape is characterized by the presence of several local telephone companies, three major long distance operators with cross-ownership with some local telephone companies, three cellular telephony providers and a myriad of internet service providers. In 2006 the National Telecommunications Company, Telecom, was sold to Spain's Telefonica. Still today, a large majority of major local telephone companies is owned by the municipalities.

The new market dynamics becomes more visible, especially during the first decade of the 21st century, with mergers that allow the creation of new service portfolios, market expansion and consequently, more investment in the network. Figure 1, Table 1 and Table 2 summarize the current state of the Colombian market. Figure 1 highlights how revenue shares have changed over the last decade for each of five major services and Table 1 shows the number of subscribers per service. As can be observed a constant decline in the share of revenue by fixed telephony is contrasted with the sharp growth of mobile subscribers. Table 2 displays the main market players in fixed telephony, Internet and mobile and the market share for each.

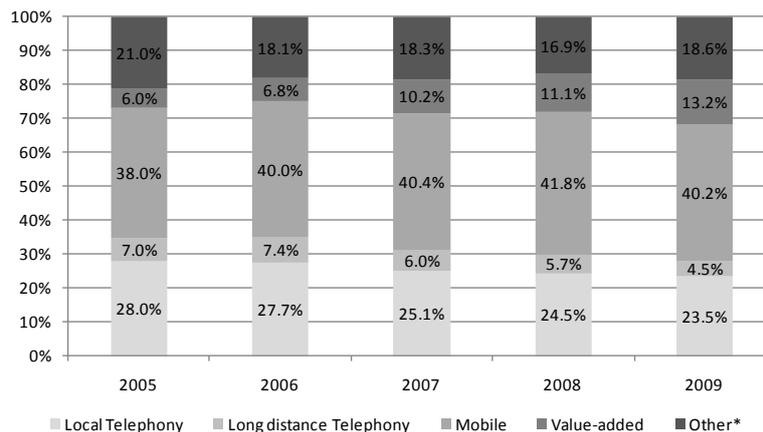


Fig. 1. Revenue share (%) by service – Colombia
 *Other include: TV, trunking, radio, postal services, international telephone service, providers.
 Source: Ministerio TIC 2010

Since 2005, revenues in the telecommunications sector have been driven by the revenues generated by mobile market, the most important telecommunications market in terms of

coverage, number of subscribers and revenue growth. At the end of 2010 the three mobile operators served 44.5 million subscribers¹, which translated into a penetration rate of 97.7%. On the other hand, fixed telephony, in spite of being the second highest earner and having a constant number of subscribers, is also the only one since 2001 with a continuing decline in revenue generation. Paid TV's market share continues to grow thanks to the increasing number of subscribers, and the diversity of pricing plans and services such as pay-per-view, premium channels and triple play.

Table 1. Subscribers by service - Colombia

Subscribers (million)					
	2006	2007	2008	2009	2010
Telephony	7.7	8.0	8.1	7.5	7.0
Mobile	29.8	33.9	41.4	41.2	44.5
Internet	0.9	1.4	2.2	3.2	4.4
TV by subscription	1.6	2.2	3.2	3.2	3.5

Source: Ministerio TIC

¹ Currently Colombian population is over 45.5 million

Table 2. Market share: Internet, fixed telephony and mobile - 2010

Fixed Internet		Fixed Telephony		Mobile	
Operator	Market share	Operator	Market share	Operator	Market Share
UNE-EPM	23.9%	ETB	27.4%	COMCEL	65.8%
TELMEX	22.3%	TELEFONICA-TELECOM	22.2%	TELEFÓNICA MÓVILES	22.5%
TELEFONICA-TELECOM	20.7%	UNE-EPM	21.7%	COLOMBIA MÓVIL	11.7%
ETB	18.2%	TELMEX	7.6%		
EMCALI	3.0%	EMCALI	6.8%		
EDATEL	2.5%	TELEBUCARAMANGA	2.8%		
TELEBUCARAMANGA	2.4%	EDATEL	2.7%		
Others	7.0%	Others	8.9%		

Source: Ministerio TIC 2011

Finally, at the end of 2010 there were more than 4.3 million Internet subscribers in Colombia with 61% being on fixed access and 39% on mobile (Table 3). Access technologies² distributes as follows: 39% DSL-based, 39% mobile, 19.8% cable (Ministerio TIC 2011). Taking account of the definition of broadband in Colombia, where the downstream is 1024 Kbps, 70 % of subscriptions fit the definition of broadband.

Table 3. Connection distribution per access type 2010 – Colombia

Access	2010	%	Average downstream
Dial-up	24 185	0.6%	NA
xDSL	1 711 586	39.0%	1 654 kbps
Cable	869 555	19.8%	1 686 kbps
WIMAX , WIFI and others wireless access	33 343	0.8%	589 kbps
Others*	36 879	0.8%	2 748 kbps
Mobile access	1 708 633	39.0%	NA
TOTAL	4 384 181	100%	

* Satellite, optical fiber, microwave radio, clear channel

Source: Ministerio TIC, 2011

3. National Broadband Policy

Compartel is the Colombian government program aimed to connect rural, remote and marginalized areas to the national telephony network. This program has progressed since its creation in 1998 from a first stage commissioned to develop community initiatives in rural telephony to a later stage that focuses on implementation of community access centres to an even more recent stage that seeks to provide broadband access to Internet in public institutions

² For broadband and narrowband

(schools, municipal libraries, local governments, hospitals). Compartel's "connectivity to public institutions" is an educational and training program aimed to unveil Internet as a tool at the workplace in different regions of Colombia.

Between 2002 and 2009 Compartel invested almost USD \$700 million which allowed the program to fulfil its goals of bringing at least one *tele-centre* (a few phone lines and Internet connections) to 100% of its targeted sites. Compartel has also deployed 1,200 Km of optical fibre, 110 stations with wireless connectivity, 39,000 broadband connections to low income families, 40,000 broadband accesses to micro, small and medium enterprises and 70,000 fixed telephone lines enabled with broadband capability. The investment is part of a government plan aimed for the development of broadband networks, including clear goals of penetration and expected access speeds.

Other government programs are "*Computadores para educar*" (Computers for education), a program through which computers discharged in public and private companies are refurbished and delivered at no cost to public schools and "*Gobierno en línea*" (On-line government) designed for the creation, establishment and practice of e-government. Table 4 displays the investment in Information and Communications Technologies (ICT) in Colombia from 2008 through 2010. In 2009 and 2010, 70% of public funds were invested in Compartel.

Table 4. Investment in the ICT sector (USD millions)

	2008	2009	2010*
Private Investment			
Mobile	691.4	715.2	-
Broadband expansion	833.7	664.1	-
Television	35.6	102.2	-
Total	1560.7	1481.4	-
Public Investment in social ICT			
Connectivity (Compartel)	114.8	203.4	214.1
<i>Computadores para Educar</i>	29.7	24.6	39.8
<i>Gobierno en línea</i>	18.0	18.2	28.9
Subsidised Postal Service	6.1	6.3	7.9
Ministerio TIC	22.1	20.1	45.4
Others	23.6	14.9	19.5
Total	214.2	287.4	355.5

*Figures from May 2010.

Source: Ministerio TIC, 2010

The immediate predecessor to the current *Vive Digital* plan was the ICT Plan 2008 – 2019 whose main goal was for Colombians to "get informed and communicate by the efficient and productive use of ICT in order to improve social inclusion and increase competitiveness" (Ministerio TIC, 2008). In October 2010 Colombia's MiniTIC launched *Vive Digital*, the broadband connectivity technology plan for the next four years. Its main goal is for the country to advance the mass use of the Internet through the deployment of broadband access, bringing on sustained progress for the national "digital ecosystem" - as explained in section 4 - on its four elements: infrastructure, services, applications and users. The Plan subscribes to what many commenters have already indicated in the sense that when consumers can freely choose applications and services and what contents they want to access or create, a "self-reinforcing cycle of investment and innovation leading to increased adoption of broadband" is enabled (FCC, 2010b). The latter drives investment in the network, causing further innovative uses and perhaps accelerated investment in contents and services. As a by-product of such a cycle of investment, it is expected that excluded users get integrated into the digital ecosystem as final prices to the consumer may decrease. The budget proposed by the government to develop the plan is 5.5 trillion pesos (US \$2.9 billion)

According to *Vive Digital* by 2014 Colombia must have reached:

- At least 50% of households and small and medium enterprises (SMEs) connected to Internet. (Currently 27% household and 7% SMEs)
- A four-fold increase in the number of Internet connections (from 2.2 million now to 8.8 million then)
- A three-fold increase in the number of municipalities connected to the fibre optics information superhighway (from today's 200 to about 700 ³)

Table 5 summarizes the main actions to be undertaken in each of the elements making up the broadband ecosystem.

³ There are 1122 municipalities in Colombia.

Table 5. Colombia's Vive Digital main goals and actions

Infrastructure	<ul style="list-style-type: none"> • International connectivity: Strengthen the infrastructure of submarine cables • Fibre-optics network expansion: Invest US\$ 200 million in order to connect 500 more municipalities to a fibre-optics backbone and assess the use of alternatives to reach the remaining 400 municipalities • Mobile Internet: Promote 3G and 4G development and allocate additional spectrum to incumbents in exchange for further wireless coverage targets Incentivize coverage in remote municipalities and last-kilometre • Promote a emergency national network • Infrastructure in rural areas • Universal public TV • Framework to duct sharing and in-house wiring • Digital Radio
Services	<ul style="list-style-type: none"> • Increase PC and terminal device penetration: Subsidies and consumer credit for PC purchase, reductions on value-added tax for Internet service • Redesign of a regulatory framework for convergence • ICT impact in the environment
Users	<ul style="list-style-type: none"> • 800 new training centres (called <i>Tecnocentros</i>): Provide training and expertise on entertainment and ICT services • Training programs for individuals, teachers and micro enterprises • A regulatory framework that includes service quality and user protection in a converged environment
Applications	<ul style="list-style-type: none"> • Online Government (e-government): Government as user and promoter of services. • Strengthening the ICT industry: Develop human resource, promote applications and contents, create conditions for advancement of the digital content industry • e-working

Source: Plan Vive Digital, 2011

4. Broadband ecosystems in three selected countries

A recent study by the World Bank (Kim, Kelly & Raja, 2010) asserts that “broadband can be considered as an ecosystem” (see Fig. 2), its elements relying on high speed connectivity, that is, broadband. Such broaden view is certainly helpful in justifying the elements of our own analysis. As the study also asserts “defining broadband to include both the supply and demand sides of the market also leads to a rethinking of approaches to spur broadband access and use”. We argue that in addition to stating a vision of broadband network infrastructure for a country, government initiatives need to strongly support themselves on the design of investment incentives and the promotion of broadband use. The latter is aligned with the need to “to create an enabling environment for supply-side growth in terms of access to networks and services” (Kim, Kelly & Raja, 2010) as it is also key to provide sustained conditions that facilitate demand for and adoption of broadband.

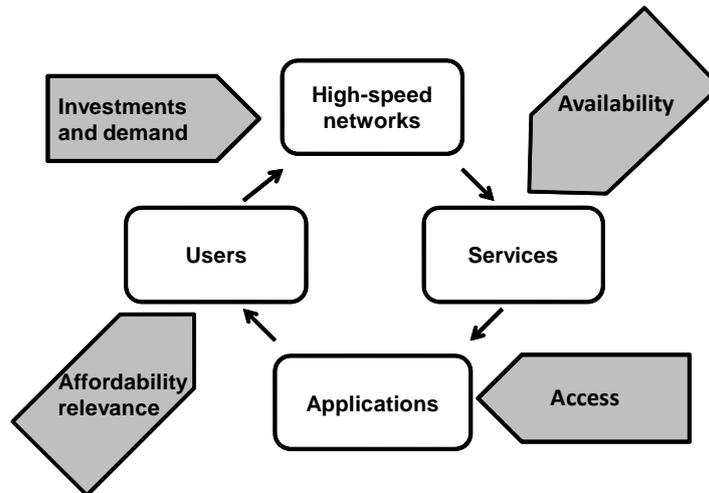


Fig. 2. The broadband ecosystem. Source: Kim et. al. (2010)

South Korea (OVUM, 2009; World Economic Forum, 2009), the Netherlands (Dutch Ministry of Economic Affairs, 2008; Dijk & Mulder, 2005) and New Zealand (Ministry of Economic Development 2008; 2009) are three countries whose broadband policies and achievements will help us illustrate a wide range of policy approaches. The countries' broadband individual statuses differ and such differences can be exploited to the benefit of identifying elements with the potential to contribute to the recommendations presented here. Our choice of countries mainly responds to our need to learn from international experience as countries such as South Korea and The Netherlands have led the way in broadband deployment and a third one, New Zealand, represents an exemplary case of one experience in-the-making. In what follows, the three country cases provide us with elements to analyse how infrastructure deployment and creation and development of services and applications have been promoted within the context of their own broadband policies. The main actions developed for each of the broadband ecosystem dimensions in each country are summarized in Table 6.

Table 6. Some actions used in the selected countries to develop broadband ecosystem

Country	Networks	Services	Applications	Users
Korea	- Public-private partnerships to support the broadband network rollout (backbone and rural connectivity) and low interest for network rollout in rural areas	- Broadband as a value added service and a facilities-based service - Regulation and competition policies (price regulation, facilitating access to spectrum, universal service, VoIP regulation, network access regulation, QoS) - Subsidized services to access broadband networks	- e-government, e-commerce, e-learning, e-working policies - Industrial ICT policies (R&D, tax and rent reductions; to promote ICT in traditional industries such as agriculture) - Security systems in networks - Content promotion and applications for people with disabilities	- Internet education programs - IT training programmes - Free access internet and access in schools
	- Interoperability and standards - Support ICT research networks - Municipalities support the develop fibre networks, - Market players are expected to invest in broadband infrastructure - Market intervention is through private-public partnerships.	- ICT as a solution to solve energy and environment problems - Promote infrastructure competition	- e-government policies - safety/security to exchange information and protecting people - develop applications to SMEs - Stimulate research in broadband technology innovation	- e-Skills to particular groups (minorities, unskilled workers, civil servants, etc.) - Consumer protection
New Zealand	- Public-private partnerships to support the broadband network rollout in the country: the ultrafast broadband network (UFB) and the rural broadband initiative (RBI) - Allocate spectrum for wireless broadband access - Consultations on NGN include interconnection, interoperability and services	- Promote the reduction of carbon emissions and sustainable resource use - Subsidies for computers and Internet access	- Awareness of online safety, security and privacy issues - Support new digital businesses and business models - Promote research - e-government policies	- Promote digital literacy - Promote digital careers and ICT skills to strengthen the workforce in ICT industry

Sources: OVUM, 2009; World Economic Forum, 2009; Dutch Ministry of Economic Affairs, 2008; Dijk & Mulder, 2005; Ministry of Economic Development 2008 and 2009

4.1. Incentives for infrastructure growth

Different countries take on different approaches to promote broadband growth. South Korea has employed three policy groups since the mid-90s, which started when the then Ministry of Information and Communication started the ambitious Korea Information Infrastructure (KII) initiative that would roll out and “advanced network infrastructure nationwide” (World Economic Forum, 2009). Originally, the construction of a broadband backbone was supported by Private-

Public Partnerships (PPP), with private parties investing more than their public counter-part. South Korea's national broadband strategy has encompassed direct and indirect support for broadband infrastructure development, including loans and other incentives. A fund for investment in ICT was created (OVUM, 2009) aimed to incentivize private participants to co-invest in broadband networks on a long-term horizon. It is now clear how private participation was successfully co-opted through the incentives structure put in place. Current government investment in the sector focuses on funding research on service and application development.

A vigorous competition for broadband deployment highlights the Dutch approach to broadband growth (EC, 2009); furthermore, local governments have added to the fast increase in broadband connections by investing in local fibre infrastructure as well (Sadowski et al., 2007). The Netherlands' broadband approach relies on competition in the access markets, promoting "both intra-modal and inter-modal competition by requiring incumbent operators to provide wholesale access to their networks, while encouraging the build-out of alternative infrastructure" (ITU, 2007). The Netherlands has taken for granted the deployment of existing infrastructure due to the high penetration of cable and focused a substantial portion of its resources on developing more broadband networks in projects such as the GigaPort Next Generation Network, Virtual lab e-science and Freeband, all of them with an investment of about € \$106 million. Such figure does not include municipal (local) infrastructure investment in broadband, or the investments made by both cable operators and KPN, the incumbent operator, in expanding and improving their broadband infrastructure. The Netherlands's current ICT agenda (2008-2011) (Dutch Ministry of Economic Affairs, 2008) emphasizes the need for infrastructure maintenance.

In 2009 the New Zealand government put forward two initiatives to develop broadband infrastructure in the country: the ultrafast broadband network (UFB) and the rural broadband initiative (RBI) (Ministry of Economic Development, 2009). With the UFB initiative the government's objective is to reach 75 per cent of New Zealanders, concentrating in the first six years on priority broadband users such as businesses, schools and health services. Established operators or new consortia are invited to participate in a bidding process that will see USD \$1.3 billion co-invested along with an equal, totalized amount invested by selected partners.

Government and partners will establish Local Fibre Companies (LFC), responsible for the operational aspects of the fibre network. Government's role in the partnership is to be a vehicle for risk and uncertainty attenuation. This is a key aspect that aims to diminish some of the obstacles NZ entrepreneurs may object to when laying plans to become part of LFCs.

PPPs have played a key factor for the deployment of broadband networks by exploiting a relationship of mutual benefit to each party. For instance, the New Zealand government seeks to work alongside with operators to develop the fibre backbone (Given, 2010). Korea promotes both private broadband investment and government aid for the construction of networks in low-density areas. In general, the incentives are offered within a collaborative framework that involves public and private parties, allowing synergies to develop with common goals for market success. In New Zealand, PPP translates into joint venture forming. An incentive scheme has been designed into the fibre network plan by which the public partner will fund the cost incurred by the private partner to connect end users; then, during the ten-year concession period the government expects that this mechanism will see the private partner progressively buy out a significant portion of the public partner's shares in the joint venture. During the concession period, the private partner will receive all of the dividends paid by the joint venture from its operating profits.

4.2. Broadband policies on service creation and application development

Kim et al. (2010) identify three stages of service development in South Korea, namely, promotion, oversight, and universalization. Incentives for the promotion of services are found in the mandate for provision of broadband networks to schools and government agencies; moreover, enablers of further development can be identified in the legislation for intermodal competition and non-discriminatory access (Kim, Kelly & Raja, 2010). Long-standing industrial policy in South Korea has been extended into the broadband deployment policy to promote ICT international collaborative research, tax incentives for new Internet-based industries, and deregulation of the high-tech sector (OVUM, 2009). Likewise policy incentives include lowering entry barriers to new service providers and unbundling the local-loop.

The Dutch government sees itself as stimulating competition and new service development, while leaving up to the market the development of a next-generation broadband infrastructure

(Picot and Wernick, 2007). Government practices a hands-off approach by which intervention is only justified when market is not able to deliver. New Zealand's Digital Strategy 2.0 proposes a widening of digital access to government services and an improved, new stage of development and improvement of local digital content; additionally the plan also foresees actions to assure creators and investors an adequate intellectual property legal framework.

4.3. Empowering the users

Government's policies that aim to promote the use of broadband networks are associated with the creation of programs expected to increase the skills and abilities of the general public. South Korea's approach to broadband use promotion includes encouraging the use of e-government to facilitate the relationship between citizens and businesses with the government, policy reforms that promote the use of e-commerce and the creation of a "safe environment" to encourage development of broadband adoption in business. The government also designated the South Korean agency for Digital Opportunity (KADO) to "ensure that all South Korean citizens have the ability to access the Internet, including the elderly and those with disabilities through targeted training programs" (ITIF, 2008).

The Netherlands' broadband national goals include the so-called Nederland BreedbandLand ("Holland Broadbandland"), an industry-aimed project for the construction of a national platform to provide aid and incentives to Hollanders for a 'better and smarter' use of broadband. The program involves the broadband industry, trade organizations and the Ministry of Economic Affairs. ICT policy in the Netherlands is embodied in a rather interesting concept, the ICT flower, a figure that explains why and how the user becomes the centre of attention and action. Paramount to the materialization of such concept is the development of e-skills which is explained by the fact that in spite of counting with one of the best worldwide broadband deployments, there are tiers of the Dutch population that do not possess enough skills to use and enjoy the growing number of online services. Thus, specific groups (the elder, ethnic minorities, low-skill workers) are among the skill development programs targets.

5. Analysis of broadband growth actions in the Vive Digital plan

The main goal of this section is to analyse the main claims and justifications presented by the Vive Digital plan in order to discuss the role of government in broadband deployment, while using the lessons from Korea, the Netherlands and New Zealand to provide supportive or deterring arguments within the scope of the main paradigmatic assertion concerning broadband deployment: private incentives or public intervention?

Table 7 compares the extent of broadband deployment in several countries, including Colombia. An analysis conducted by Ministerio TIC on the current state of the country in areas such as Internet and computer penetration and IT investment show, among other things, that Colombia's investment levels are less than those of other countries in the Latin American region. The analysis also identifies the gaps in Internet access between affluent layers of the population and those on the lower socioeconomic tiers (Plan Vive Digital, 2011). Investment in broadband access expansion announced by Vive Digital would mean that the government will invest about 4.4 U.S. dollars a per-capita basis.

Table 7 Comparative Internet and PC penetration

Country	Fixed Broadband		Mobile Internet		PC
	Subscribers inhabitants	per 100	Subscribers inhabitants	per 100	% households with a computer
Germany	30.4		25.5		81.8
EEUU	27.1		21.5		72.5
Israel	25.8		29.9		70.9
Japan	24.9		74.0		85.9
Singapore	23.7		61.1		80.0
Spain	21.6		24.2		63.6
Chile	9.8		12.6		60.0
Mexico	9.1		2.3		28.0
Brasil	7.5		5.9		42.0
Colombia	4.6		2.6		23.0
Peru	2.8		0.8		19.0

Source: Plan Vive Digital, 2011

Previous sections outlined the major developments in the deployments of broadband access in three selected countries. Such developments correspond to either coordinated policy issues executed by a central government, or local initiatives that occasionally explore Public-Private-

Partnerships (PPPs), or infrastructure investments by major operators. A common feature of the New Zealand and South Korea's plans, as (Falch & Henten 2010) assert, is their somewhat level of "distrust in the ability of market forces" to deliver a broadband infrastructure. To the extent that local government bodies have also hopped on the broadband train, such as in The Netherlands, it is also obvious that despite the central government's promotion of competition in the access markets there is not full reliance on markets to deliver on broadband penetration.

In Colombia, developing a national fibre backbone will encounter at least two major obstacles: the small size of the market with few opportunities for further development, and the lack of articulation between the public's interest, the providers' commercial objectives and the government's policies and plans. By far, the largest misalignment occurs between the government expectations and the providers' deployment plans, which do not necessarily attend to any of the social expectations heralded by the government. Therefore, if the vision of broadband access to Internet services as an engine of economic growth is widely shared, the question to answer is, how can a country like Colombia deploy a Next-Generation Access (NGA) infrastructure on a timely and economically efficient way?

5.1. The role of government in the deployment of a broadband infrastructure

Vive Digital plan starts off with the acceptance of the role for the government in the build-up of broadband accesses. It builds a case for government intervention in the development of the country's broadband infrastructure by invoking international benchmarking exercises such as a report by UNCTAD (UNCTAD, 2010), which argues about the inverse correlation between a country's poverty index and its Internet penetration (number of users), and a recent study by the World Bank stating that a 10% growth in broadband penetration impacts economic growth (GDP) by 1.4% (World Bank, 2009). In a summary of access to ICT, the plan mentions that, as of 2010 Colombia's broadband penetration is 4,6 - if broadband is defined as at least 512 Kbps, while mobile Internet penetration is 2,6 and only 23% of households have at least one PC (ITU 2009). The result is that broadband, mobile Internet and PC penetration are below the region's averages (ITU 2009).

Other findings are that in spite of having similar ICT policy and displaying a broadband ecosystem not quite different to those of other countries in the region or countries with

comparable per-capita GDP, Colombia's investment in ICT is comparatively lower (Cisco 2009); the latter is exhibited as a major limitation to the growth of broadband. On the other hand, the plan refers to a UN E-government survey (UN 2010) that ranks Colombia's e-government development first in Latin America, just below USA and Canada in the whole of America. As the facts are stated and the comparative situation of the deployment of broadband in Colombia is better understood, the question to address is about the role of government. We agree with the proposition that the government should be a promoter of market efficiency and grantor of equitable access and its intervention justified when "the benefits of intervening outweigh the costs" (Kelly et al. 2009).

It seems now obvious that the government, committed to bringing the benefits of Internet to its citizens, should find a way to accelerate the expansion of the access network. The solution offered by Vive Digital is the build-up of a national optical fibre network (details of which we present in the next section) as a response to the underperforming and concentrated broadband market. Such project has to address two main issues: what mechanisms will the network build-up agreement include so that the proposed network and its operation do not provide the wrong signals to the market to the extent that investment in access, and even core network, is not slowed down or brought to a halt?, and, how large should the extent of market intervention be? Established telephone companies, either privately owned such as Telefonica or owned by municipalities such as the next three largest city companies, have been generally unable to significantly uplift the reach of broadband access. The Colombian broadband market is remarkably skewed; cream-skimming strategies have contributed to the highly concentrated broadband access offer. Consumers in most affluent zones in the largest urban centres usually have two or three options to get a broadband connection: one or two local telephone companies, one or two cable TV operators and sometimes even a wireless broadband network. However less affluent zones struggle to have broadband access at all or are only offered the incumbent service; the latter is typical of many mid-size and small urban centres where Telefonica is the only telephone provider. The situation is even more critical for very low income neighbourhoods and the poorer segments of population where the combination of their very limited income and the restricted offers from telephone companies combine to produce a very low broadband penetration index.

All efforts on the demand and supply sides of the broadband market need to be complemented by a serious revamping of the regulatory framework and the introduction of pro-competition, incentive-based regulatory norms. Currently the two most recent regulation-related initiatives are suspended, pending its resubmission to Congress, the approval of the new National Telecommunications Law and the likely disappearance of the National TV Commission. Vive Digital has announced it will take on a new a draft of the “regulation for convergence” but it is yet unknown if and when the Communications Regulatory Commission will resume the public discussion on its proposal for a convergent regulatory framework. Now the government seems keen on pursuing the revamping of regulation in the sector. Having decided to invest on fibre deployment, the government must resolve the regulatory framework upgrade as a matter of urgency.

5.2. Vive Digital’s main projects

In this section we enumerate, describe and analyse the most important projects proposed by Vive Digital.

5.2.1. Public or private investment

The slow pace with which the number of broadband connections grows (Plan Vive Digital, 2011), in spite of the increasing growth in Internet-based activities such as e-commerce (EIU, 2010) and e-government services (UN, 2010) calls for initiative and leadership in providing the broadband ecosystem with an urgent solution to the deficient infrastructure. Compartel, a marginal solution for consumers on the fringes of geography and income, has been able to achieve some connectivity goals. Thus, Vive Digital plans to invest over US\$ 200 million in a nation-wide optical fibre network that connects 700 towns. Currently only 200 municipalities have at least one fibre access node of the network that was built in the mid-1990s.

Since not all urban centres will be covered, the government plans to incite further expansion with hybrid broadband accesses that include wireless solutions. Ministerio TIC’s Vive Digital plans to promote the use of wireless access in many remote and rural areas. As asserted by Gamboa and Otero “the diverse topography of the country has delayed the installation of the

required infrastructure in remote areas leaving a non-negligible proportion of the population without access to the service". (Gamboa and Otero 2009)

The plan calls for a sort of a PPP initiative that would have a private party build the broadband network with an investment of two-thirds of the total expected cost, estimated at about US \$600 million; the network will be an open access infrastructure where no access seeker can be discriminated against. The project involves two main stages: build-up and operation. After the build-up stage is finished the private party will be the owner of the deployed infrastructure (Ministerio TIC, 2011).

Several issues immediately arise from the proposed scheme: a. what is the advantage of partnering with a single contractor as opposed to designing a multi-region network project? b. why will ownership of the network be immediately transferred to the contractor after stage 1 is finished as opposed as relying on some sort of scheme by which the government recovers the taxpayers' money?, and c. how will competition unfold in an open access broadband network if an existing wholly integrated operator become also the operator of the new platform?

The questions point at aspects of competition and the possible threats that may arise under the proposed market design; as a matter of comparison the New Zealand UFB initiative divides the country in 33 regions each of which has got several bids for network build-up; open access is assumed to guarantee competition on the service layer with the network provider only selling Layer-2 services⁴ to service providers; and, during the ten-year concession period, the private partner is expected to progressively buy out a significant portion of the public partner's shares in the joint venture.

As much as the New Zealand government has dealt with Telecom NZ bids in a somewhat different way, which has included requesting Telecom to divest its retail and wholesale units, the Colombian government needs also to regard the role of Telefonica as a special case if Telefonica is allowed to participate in the process. Currently there are no provisions in the proposal to consider bans or special conditions on any potential bidder (Ministerio TIC, 2011).

⁴ Wholesale services for access to Layer-2 in a Metro Ethernet-based network. Services provided to end-user by service providers will operate on top of Layer-2 services provided by the network operator.

As the plan also proposes complete ownership transfer at the end of stage 1, which has been planned to take one year, the government would not have to face the problem the NZ government will face with its double role as investor (partner) and regulator. In fairness, the NZ project has proposed a 10-year “regulatory holiday” period, which is currently intensely debated in the country.

Finally the plan does not address the role of local governments in the expansion of Internet access. In recent years several municipalities have deployed wireless urban networks for Internet access. Although their reach is limited, the accumulation of experience at the local level, which has proven to be successful in The Netherlands, should be a factor to count on.

5.2.2. Allocation of further spectrum bands

The plan proposes to auction off 30 MHz on the 1.9 GHz band and expects to raise about US \$94 million in August 2011. The qualifying conditions for interested parties – such as at least 4-year experience as a telecommunications operator, among others – will guarantee a fair number of bidders, in addition to the three existing cellular companies. Subsequently, further spectrum following IMT, on the 2.5 GHz and 1.7 - 2.1 GHz bands will be auctioned.

It has been recognized that radically new approaches to spectrum allocation must be tried if broadband wireless access is to become an affordable, competitive alternative to FTTX deployments. As stated in (Gamboa and Otero 2009) “increasing mobile diffusion in remote areas could generate a positive externality on internet diffusion and access”, which would clearly alleviate the urgency of having better connectivity in places where fixed accesses are very expensive to deploy. Vive Digital proposes allocation of additional spectrum to incumbents for 3G and 4G developments in exchange for further wireless coverage targets, and incentives for mobile coverage expansion in remote municipalities.

Regardless of the specific allocation process for the 1.9 MHz band, any wireless government initiative will be put under fierce scrutiny by the dominant cellular providers. With such a rapid growth in the cellular market one has to wonder whether the role of government would have to be limited to the competitive allocation of new spectrum. It is true that the geographical conditions of many towns and human settlements in Colombia and the already clogged utilised

bands demand a rapid solution that allocates further spectrum; however, no incumbent would like to see itself challenged by new comers that may reap early benefits of providing broadband wireless access. Striking a balance between fair competition for new spectrum and the allocation of “*additional spectrum to incumbents in exchange for further wireless coverage targets*” is a balancing act the government must play carefully.

5.2.3. Online Government (e-government)

A 2010 survey by UNDESA, a United Nations agency for social and economic affairs, ranked Colombia first among 33 Latin American countries in e-participation and e-government. Such achievement is due to the work developed in recent years under the “On-line government” initiative. Looking forward it seems the government is well-positioned to become a main actor in the use and promotion of e-services to be deployed in the next generation of networks. In 2011 \$27 million dollars will be invested on the integration of dispersed e-service platforms owned by several government agencies.

As the plan attests there is a markedly heavy reliance on the “supply side” of e-government services; for instance, the plan seeks to further engage the local governments (provincial and municipal) in the provision of e-services as well as several proposals to implement systems that improve the efficiency of the Office of the Comptroller, the public notary system and support democratic participation such as public auditing of government operation by the citizens. In spite of the success of the Colombian e-government initiative thus far, the unequal and concentrated offer of commercial Internet access and the low income earned by a large fraction of the population may dampen its effects. Further coordinated actions must be taken to match the supply efforts with the demand side.

Clearly, on-line access to government services must be a government-led initiative that should benefit all citizens. The country cases mentioned before contain leading initiatives such as Korea’s plans for ubiquitous government (u-government) services using RFID and WIBro-enabled technologies and for voting through mobile channels (u-voting) and home voting. A more efficient and transparent government for the people of Colombia is a noble goal that has nevertheless to face many realities (increasing corruption in public procurement, widespread

poverty, a slow change to adopt new practices for attention to citizens) that relegate innovative uses of technologies to the solution of more basic, structural problems.

6. Conclusion

This paper reviews the current state of broadband deployment and growth initiatives in Colombia, using three OECD country cases to draw helpful, informative learning about the how to promote the development of each of the four major facets of a broadband ecosystem. A deeper look into those countries' experiences, which either exhibit remarkable progress or promise significant results encouraged us to use them as solid guidelines for analysing Colombia's own broadband expansion plan named Vive Digital. Consequently the paper identifies several strengths and weaknesses of the current plan and discusses the role of the government involvement in broadband access deployment. As the expansion of broadband occurs within the context of a larger concept known as the broadband ecosystem, the paper also presents and discusses several government-led projects that complement the core broadband plan.

Colombia's Ministerio TIC has embraced the ecosystem concept and has outlines actions alongside the four ecosystem elements. As it currently stands the plan still needs to fully spell the conditions that will drive the build-up of a national optical fibre network and the incentive scheme for the allocation of spectrum for 3G and 4G. The paper contributes to linking achievements and proposals developed in three country cases with the goals and expectations of the Colombian plan. As the Colombian government has joined other governments that support public funding of broadband access, it remains to be seen the extent of effects on the market and the degree of consolidation of the broadband ecosystem.

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