



**USAID**  
FROM THE AMERICAN PEOPLE

# Leverage at the Speed of Light

## Optical Fiber and Development Opportunities in Colombia

April 23, 2012



April 23, 2012

This publication was produced for review by the United States Agency for International Development. It was prepared by Integra Government Services International, LLC.



# Leverage at the Speed of Light

Optical Fiber and Development

Opportunities in Colombia

April 23, 2012

## Disclaimer

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

# Table of Contents

<b>Table of Contents</b>	<b>iv</b>
<b>Introduction</b>	<b>1</b>
<b>Colombia's Activist ICT Policy - Vive Digital</b> Economic Growth and Alternative Livelihoods	<b>2</b>
<b>Leverage Opportunities for USAID</b> ICT for Health and Education ICT for Peace	<b>3</b>
<b>Current USAID/Washington Engagement with COMPARTEL</b> Evaluating local connectivity infrastructure options in rural areas Facilitating demand for ICT services Defining COMPARTEL's role post-Vive Digital	<b>5</b>
<b>Next Steps</b> Rural Access Demand Facilitation Summary	<b>6</b>
<b>Annexes</b> Annex 1 – Data on Priority Municipalities Annex 2 – Location of Priority Municipalities in Colombia	<b>8</b>

# Introduction

Colombia today presents a starkly different picture from the war-torn drug republic that gained a global reputation in the 1980's and 90's. Since 2000 economic growth has averaged over 4 percent per year, and the country's per capita income has more than doubled. In a nation of 44 million people, 12 million have entered an emerging middle class over that last decade, and over that same period foreign investment has increased by 100 percent. Last year Colombian bonds were promoted to "investment grade" by all three of the large rating agencies, ensuring that this trend will continue.

Colombia's economic performance over that last twelve years has been accompanied by a technological revolution. As in much of the world, mobile phone use has scaled to the point that devices that were once exclusive now outnumber people (a 103 percent penetration rate). Over thirty-six percent of the population uses the Internet.

Colombia's impressive economic growth and its rapid adoption of technology are related. Not only does increased income drive demand for technology, but studies have identified a causal relationship between technology use and economic growth. Technology facilitates access to information, which can be used to make better business decisions, mitigate risks, expedite processes, and improve practices. The result is that a 10 percent increase in the share of the population that uses information and communications technology (ICT) will increase economic growth between 0.5 percent and 1.5 percent. Consequently, Colombia's nexus of economic and technology growth is a virtuous circle, and the government is actively taking steps to ensure the whole country benefits.

# Colombia's Activist ICT Policy: Vive Digital

In 2010 the Colombian government, through its social telecommunications program COMPARTEL (an initiative of the ICT Ministry), launched a massive new ICT agenda called Vive Digital. The program will invest \$2.25 billion of public funds and will leverage \$10.25 billion of private sector money between 2010 and 2014. The program has three overall goals that will be achieved through a series of projects, designed and implemented on a yearly basis. The three overall objectives of Vive Digital are as follows:

1. Connect 50 percent of all households and 50 percent of all MSMEs in Colombia to the Internet (from a 2010 base of 27 percent and 7 percent, respectively).
2. Create 6.4 million new Internet connections, wired and wireless.
3. More than triple the number of municipalities connected to an optical fiber backbone (to achieve 96 percent coverage at municipality level).



When launched in 2010, Vive Digital consisted of three projects: a public-private partnership (PPP) for the extension of the national fiber-optic backbone by 18,000 km to cover 1,078 out of Colombia's 1,122 municipalities, an effort to provide connectivity to 10,000 public institutions such as libraries, and a push to provide 115,000 low income urban households access to in-home Internet for \$10/month. All of these projects are under implementation, most notably the fiber backbone, which is being constructed by the Salinas group at a cost of over \$600 million, and which will be operated as an open-access network for the whole country.

Additional projects have been developed for the second year of Vive Digital. These include an effort to reach all communities of 100 people or more with at least one public telecenter (the Centros Poblados initiative) and one that will install 800 "Techno Centros" in urban areas connected to the fiber backbone. The Techno Centros will include 20-30 laptops, high speed Internet, room for gatherings, training courses on computing and IT skills, basic skills courses such as financial management, and even offer games to users. Additionally, the government has just issued its first 4G license, to the network operator UNE.

The Vive Digital program represents an extremely valuable entry point for USAID to help shape the future of the Internet in Colombia. It also provides important opportunities to leverage technology to strengthen current programming.

# Leverage Opportunities for USAID

Because Vive Digital focuses on underserved rural communities it will benefit the municipalities where USAID focuses most of its work. Under this program, 32 of the 51 municipalities prioritized by USAID/Colombia will be connected to the national Internet backbone for the first time. This will mean that at the completion of Vive Digital, only 2 of USAID's priority municipalities will remain unconnected from terrestrial Internet (Puerto Leguizamo in Putumayo and La Macarena in Meta). The full list of municipalities to be connected (and date of connection) is available in Annex 1, but the maps in figure 1 below give a good overview of what Vive Digital will do with optical fiber; and how it will bring connectivity to municipalities that are important for security reasons. The maps indicate current fiber backbone coverage (left) and additional coverage to be provided by the project (center). Note that the map in the center does not present cumulative coverage. The map on the right shows how President Santos' "Comprehensive Policy on Security and Defense for Prosperity" ranks regions in Colombia. Red municipalities are those where military intervention is still required, yellow areas are zones where military gains are being consolidated by bringing in other state services, and green zones are peaceful and secure. Note how the Vive Digital program is bringing connectivity to many red and yellow zones.

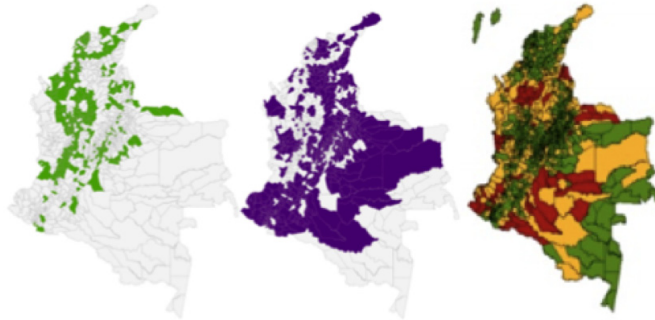


Figure 1 – The Reach of optical fiber in pre-Vive Digital Colombia, new areas to which Vive Digital will expand fiber access, and the security situation in Colombia

As a consequence of Vive Digital, USAID will, for the first time, be able to leverage inexpensive (i.e. non-satellite) telecommunications to strengthen its work on alternative livelihoods, consolidation, economic growth, and social inclusion in the vast majority of its geographic project locations. The possibilities are extensive.

## Economic Growth and Alternative Livelihoods

As mentioned earlier, numerous studies have confirmed the positive economic impact of broadband on economic growth at the macro level.<sup>i</sup> Further, the growth obtained from broadband expansion creates jobs. For example, in Brazil, broadband was found to add up to 1.4 percent to the employment growth rate.<sup>ii</sup> So before entering any discussion of specific applications it is important to understand that people will use the Internet for these productive purposes without being coached on specifics. However, targeted programs can make use of specific applications as part of a value chain approach to improving the economic performance of a sector.

For example, within agriculture – a key focus of alternative livelihood strategies - there are specific applications aimed to help source inputs, improve practices, mitigate financial risk, facilitate marketing at both the wholesale and retail level, and allow a product to be traced from origin to consumption. A number of these have been used by USAID throughout the world with much success. For example, USAID/East Africa successfully used Sustainable Harvest's "Relationship Information Tracking System" to

<sup>i</sup> World Bank (2009), McKenzie and Co. in Buttkeireit et al. (2009)

<sup>ii</sup> World Bank's Broadband Strategies Handbook, 2012

provide source information on exported Kenyan coffee, allowing it to command a price premium in the international market.

Further, access to the Internet will allow residents of rural regions of Colombia to learn skills necessary to enter the digital workforce. With fast Internet access, and COMPARTEL-funded computer labs in schools and in public telecenters, the opportunity exists to train rural residents, especially youth, in skills that will allow them to work in the knowledge economy, a powerful draw away from illicit activities.

### **ICT for Health and Education**

Social inclusion is an important component of Consolidation, and equal access to both health care and educational opportunities is key to weaving an effective social fabric. Public service delivery has always been difficult in remote rural areas, and mobile communications and Internet access are now poised to ease many of the burdens of doing so.

In health care provision, a constant problem in the developing world is the shortage of available doctors, and their concentration in cities. Mobile technologies, such as “MobileMedic” allow patients in rural areas to interact with, and receive diagnoses from, doctors in urban areas at minimal cost to them. These interactions can help the patient decide if the costly trip to a nearby city to see a doctor in person and receive treatment is worth it. Further, mobile telephony can spread information about proper health care procedures, combatting rumor and ending traditional practices that could in fact be harmful.

In education, textbooks, once a scarce commodity, can now be beamed to electronic devices in classrooms. In poor areas where field trips were once impossible, they can now be done virtually. If teacher absenteeism is a problem, they can be forced to text a time-stamped photo of themselves with their students to a central administrative office every day in order to receive a paycheck (this has proved especially effective in India). In short, digital tools available over the Internet or mobile networks can help level the educational playing field between relatively rich urban students and those in poorer rural areas.

### **ICT for Peace**

Violence prevention and conflict avoidance are other programmatic themes that digital technology can strengthen. Perpetuators of violence can be tracked via crowd-sourced mapware, and citizens can take appropriate action after receiving messages from a conflict early warning system. Further, violent behavior can be curbed through ICT-enabled behavior change campaigns, rumors that could perpetuate preemptive violent action can be quashed, and dialogue forums can be more easily sustained. Perhaps the most famous example of crowd-sourced violence tracking is Ushahidi, meaning “testimony” in Swahili, a mobile phone application that allowed users to report incidents in Kenya during the post-election violence there in early 2008. The reports, if corroborated by multiple messages, were mapped in an accessible way that was used by both the police, to target resources, and by the citizenry, to either feel assured that the violence was far from them or to know when to leave an area.

In Colombia, crowd-sourced warnings of violence could be used to effectively marshal defense resources. Safety campaigns could be run on mobile phones to train people in how to report an attack or on how to give first aid to victims. Community response groups could be better coordinated through the use of digital tools. Land records could be digitized, and conflict over usage rights could be better mediated and more quickly resolved. All of these uses of ICT would contribute to greater community confidence and increase their investment in productive assets, enhancing their economic prospects and improving consolidation and “alternative livelihoods” outcomes.



# Current USAID/Washington Engagement with COMPARTEL

USAID/Washington, through the EGAT Bureau's Global Broadband and Innovations (GBI) program, has signed an agreement with COMPARTEL to provide technical assistance on rural connectivity. The cooperation will focus on helping COMPARTEL understand the telecommunications market in Colombia, and use that understanding to tailor their rural connectivity strategy. Specific areas of focus will include the following.

## Evaluating local connectivity infrastructure options in rural areas

Current thinking in the ICT ministry is that once municipalities are connected to the fiber backbone the local distribution of connectivity will be handled by a willing private company. They will either build towers capable offering mobile Internet, install cable to people's homes, or go so far as to follow the "fiber-to-the-home" model pioneered on the island of San Andres (equivalent to Verizon FiOS in the US). Consequently, the Vive Digital plan does not include a component that will facilitate the construction of 3G and 4G cellular towers in rural areas, or otherwise support the provision of in-home connectivity. GBI will work with COMPARTEL to re-evaluate this assumption, given compelling data that suggests their current strategy, which relies solely on building demand, will not be enough to create a viable market for private service providers. The creation of a universal service regime that supports mobile Internet expansion could be a major leave-behind of USAID involvement.

## Facilitating demand for ICT services

After providing fiber connectivity to rural areas, COMPARTEL will make a major push to drive demand for Internet services in newly connected municipalities. They will provide telecenters through the Centros Poblados program that will offer skill-building courses and provide citizens with a low cost opportunity to try the Internet. Further, they will connect thousands of schools and support a curriculum that trains students in how to use ICTs. The effectiveness of these interventions needs to be measured. Also, other options remain on the table and could potentially be implemented. These include offering online tools that allow people, and especially local businesses, to interact with the municipal government in a way that improves efficiency. Another policy option, and one that needs to be evaluated for sustainability, is to subsidize device ownership. Other options include public relations efforts to ensure businesses understand that their information is safe and secure when stored online, or efforts to work with local technology entrepreneurs to encourage the creation of applications and content that could be useful for the populations of rural areas. GBI will work with COMPARTEL to define and evaluate this program of demand facilitation.

## Defining COMPARTEL's role post-Vive Digital

As an extension of our work on demand facilitation, GBI will provide consulting services to COMPARTEL aimed at creating a strategic plan to take effect once its flagship connectivity expansion program is completed in 2014.



Jonathan Malagón, CEO of COMPARTEL, speaks at stakeholders' meeting in February 2012.

Photo: Ministerio TIC Colombia

# Next Steps

Given that the Colombian government's program of connectivity expansion presents USAID with a unique opportunity to leverage telecommunications for development purposes, and that GBI offers USAID/Colombia a valuable point of entry into the program, the next question should be "how to proceed." There are two fronts on which USAID/Colombia should consider pushing.

## Rural Access

First, although COMPARTEL is providing fiber connectivity to municipalities and is building computer labs in telecenters and schools, work remains to be done to ensure that all citizens of a municipality have affordable access to the Internet. There are certain areas where the private sector will almost certainly not be willing to provide telecommunications infrastructure, they are simply too remote.

A mobile network operator's profits from building an additional 3G/4G tower are a function of the wealth and size of the population within range of the tower, as well as the cost of providing that infrastructure. Consequently, it is easier for them to provide service in population centers, and rural areas remain underserved. As COMPARTEL provides fiber access in municipalities, the cost of providing service in these areas will fall. But further cost savings will still be required in order to profitably offer broadband services to the most remote populations. The major points of possible cost savings associated with providing service in remote areas are electricity for tower operation and the cost of the infrastructure itself.

The technology exists to significantly lower costs in these areas. Base stations operating "small cells" can be procured for 20 percent of the cost of a traditional cell phone facility, and they draw significantly less power. Consequently, they can be operated with a small solar array or a hybrid power supply, and operational costs are reduced to a fraction of what they would be otherwise. Using small cell technology, it is profitable for an operator to install service in an isolated rural village where inhabitants can pay as little as \$3 per month for access, a price which many studies have shown is within the willingness to pay of those living on \$1/day.

There is room for USAID to work with the private sector to prove the "small-cell" business model and pave the way for expanded network access in rural areas. Pilot deployments could be made in consolidation zones so that the benefits of ICT access for alternative livelihoods and social inclusion could also be tested. If successful, ICT-access and ICT projects could be scaled to all 51 *municipios* subject to USAID intervention.

## Demand Facilitation

There is much room for USAID/Colombia to support demand facilitation by incorporating ICT tools in its development projects. This could be done in education, health, agriculture, or security, among other sectors. For example, Alternative Livelihood projects could include a fund to support the creation of ICT application and services that promote farming. Or they could work to build ICT skills in young people to improve their employability. These options would allow USAID to create programming that benefits from connectivity, but also increases the use of ICT, which itself creates a virtuous circle of increasing economic growth.

USAID/Colombia, in addition to supporting demand indirectly through sectoral programs, could do so directly, by working with local governments or local firms and NGOs to develop content that links them to clients. Additional options include creating school Internet programs and building effective adult digital literacy curricula in community telecenters. These efforts would strengthen social inclusion and enhance efforts made in developing alternative livelihoods.

### Summary

COMPARTEL's active, and extremely effective, policy of ICT expansion – one of the largest and most successful in the entire world - provides a very strong leverage opportunity for USAID/Colombia. The state of the Internet in rural areas of the country is set to change dramatically in the next two years. By working to include ICTs in rural programming USAID/Colombia will help COMPARTEL create demand for these new Internet services. This will increase the size of the network in the country, and help allow telecommunications firms to build more infrastructure in rural areas. In short, it will create a virtuous circle of economic growth and technology use that will help Colombia meet its development goals.



Children from remote areas of the country benefiting from the Vive Digital project.

Photo: Ministerio TIC Colombia

# Annexes

## Annex I – Data on Priority Municipalities

ZONA FOCALIZADA	Departamento	Municipio	To be connected to fiber by <i>Vive Digital</i> ?	Date to be Connected	Fixed Internet Penetration	Total Population	Share of Population that is Rural
CATATUMBO (región fronteriza)	NORTE DE SANTANDER	CONVENCION	Y	Nov. 2012	0.22%	14,679	58.61%
		EL CARMEN	Y	Nov. 2012	0.10%	14,911	82.34%
		EI TARRA	Y	Nov. 2012	0.29%	10,853	65.04%
		HACARÍ	Y	Nov. 2012	0.04%	10,416	89.60%
		SAN CALIXTO	Y	Nov. 2012	0.08%	13,088	86.12%
		TEORAMA	Y	Nov. 2012	0.06%	19,790	89.08%
		TIBU	Y	Nov. 2012	1.37%	35,723	66.62%
CORDILLERA CENTRAL (Sur del Tolima, Valle y Norte del Cauca)	TOLIMA	ATACO	Y	Jan. 2014	0.11%	22,243	79.31%
		CHAPARRAL	Already Connected		0.62%	46,981	
		PLANADAS	Y	Jan. 2014	0.07%	29,739	75.76%
		RIOBLANCO	Y	Jan. 2014	0.07%	24,985	82.73%
	VALLE DEL CAUCA	PRADERA	Already Connected		2.29%	52,493	
		FLORIDA	Already Connected		2.00%	57,264	
	CAUCA	MIRANDA	Y	May-14	0.68%	36,901	40.32%
		CORINTO	Y	May-14	0.06%	30,319	59.92%
		CALOTO	Y	May-14	0.35%	17,499	76.30%
		SANTANDER DE QUILICHAO	Already Connected		2.01%	87,872	
TORIBIO	Y	May-14	0.05%	27,958	93.92%		
MONTES DE MARIA	BOLIVAR	EL CARMEN DE BOLIVAR	Already Connected		0.81%	71,854	
		SAN JACINTO	Already Connected		0.08%	21,456	
	SUCRE	OVEJAS	Y	Nov. 2012	0.10%	21,303	47.44%
		SAN ONOFRE	Already Connected		0.77%	48,566	
NUDO DE PARAMILLO (Bajo Cauca Antioqueño y Sur de Córdoba)	ANTIOQUIA	ANORÍ	Y	Nov. 2012	1.88%	16,237	67.48%
		BRICEÑO	Y	Nov. 2012	1.52%	8,737	75.13%
		CACERES	Already Connected		0.83%	33,950	
		CAUCASIA	Already Connected		3.51%	101,788	
		EL BAGRE	Already Connected		2.86%	48,211	
		ITUANGO	Y	Nov. 2012	1.61%	22,538	73.31%
		NECHÍ	Y	Nov. 2012	1.12%	24,085	56.65%
		TARAZA	Already Connected		1.22%	38,191	
		VALDIVIA	Already Connected		1.11%	20,055	
		ZARAGOZA	Already Connected		1.89%	29,228	
	CORDOBA	MONTELIBANO	Already Connected		3.66%	74,284	
		PUERTO LIBERTADOR	Y	Nov. 2012	0.05%	41,924	68.57%
		TIERRALTA	Already Connected		0.96%	90,738	
		VALENCIA	Y	Nov. 2012	0.50%	39,258	68.48%
SAN JOSE DE URE	Y	Nov. 2012	0.00%	10,376			
PUTUMAYO (región fronteriza)	PUTUMAYO	LEGUIZAMO	NO		0.47%	15,613	
		PUERTO ASIS	Y	May-14	2.03%	57,951	52.36%
		SAN MIGUEL	Y	May-14	0.01%	24,488	80.59%
		VALLE DEL GUAMUEZ	Y	May-14	0.83%	49,272	64.81%
		LA MACARENA	NO		0.07%	29,234	
REGIÓN MACARENA- RÍO CAGUÁN	META	MESETAS	Already Connected		0.05%	11,035	
		PUERTO RICO	Y	Jan. 2014	0.02%	18,206	72.75%
		SAN JUAN DE ARAMA	Y	Jan. 2014	0.08%	8,986	62.23%
		URIBE	Already Connected		0.02%	14,644	
	CAQUETA	VISTA HERMOSA	Y	Jan. 2014	0.05%	23,707	73.99%
		CARTAGENA DEL CHAIRA	Y	May-14	0.12%	31,416	70.00%
		SAN VICENTE DEL CAGUAN	Y	May-14	0.90%	63,239	50.96%
		LA MONTAÑITA	Y	May-14	0.04%	22,989	81.53%
NARIÑO	NARIÑO	TUMACO	Y	May-14	0.92%	183,006	53.73%

Annex 2 – Location of Priority Municipalities in Colombia



**U.S. Agency for International Development**

1300 Pennsylvania Avenue, NW

Washington, DC 20523

Tel: (202) 712-0000

Fax: (202) 216-3524

**[www.usaid.gov](http://www.usaid.gov)**