



**EXPANDING INTERNET
CONNECTIVITY AND ACCESS
IN CUBA**

WHITE PAPER FOR THE MINISTRY OF INFORMATION AND COMMUNICATIONS

*PREPARED BY:
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TABLE OF CONTENTS

Executive Summary 2

Exigence for ICT Expansion 2

Background 3

Comprehensive Policy Proposal

 Increasing connectivity to Cuba

 Increasing connectivity within Cuba

 Increasing accessibility for Internet users

 Maintaining Internet security & integrity

Potential Partners

Conclusion

References

I. Executive Summary

Cuba holds enormous potential as a breakout tech leader, yet growth in the information and communications technology (ICT) sector has previously been hindered by the U.S. embargo and deficient, outdated infrastructure. In assessing the barriers to growth, we recommend significant investment in telecommunications infrastructure to increase broadband Internet connectivity, both to and within Cuba. Further, we assess non-technological barriers to accessing the network, identifying the need for scaled reductions in the price of service and more affordable devices for accessing the network. We conclude by identifying candidates for public-private partnerships and potential sources for financing.

II. Exigence for ICT Expansion

Twenty years ago, Fidel Castro anticipated the enormous potential for technology as a driver of the Cuban economy and launched the “Future Project,” a bold initiative to transform Cuba into a software engineering and developing center.¹ In the years since, Cuba has made progress towards this goal, in spite of the suffocating effects of the U.S. economic embargo, and stands today poised to become a breakout tech leader over the coming decade. Boasting a per-capita research and development investment rate 30 times that of India and larger than that of even the U.S., Cuba has already received international recognition for its burgeoning tech centers.² The island holds enormous human capital potential in its highly educated, 100% literate workforce.³ Despite this potential, Cuba’s ICT sector growth has been undercut by one the lowest levels of Internet penetration in the world.⁴ With the remnants of the U.S. embargo now in a slow

collapse, all that holds Cuba back from realizing Fidel's second revolution is lack of infrastructure, financing, and partners.

III. Background

Economic reintegration with the United States

American policy changes now permit commercial import of American telecommunications products, infrastructure creation, and a broad range of other ICT. Stemming from a 2009 U.S. presidential directive, U.S. telecom providers are now authorized “to enter into agreements to establish fiber-optic cable and satellite telecommunications facilities linking the United States and Cuba; license U.S. service providers to enter into roaming service agreements with Cuban provider; license U.S. satellite radio and satellite television providers to engage in transactions necessary to provide services to customers in Cuba; license persons subject to U.S. jurisdiction to pay for telecommunications, satellite radio, and satellite television services provided to individuals in Cuba; and authorize the export to Cuba of donated consumer communications devices (CCDs) such as mobile phone systems, computers and satellite receivers.”⁵ Further steps towards rapprochement later amended U.S. regulations to “allow for the commercial export of telecommunications products, including those for accessing the Internet, use of Internet services, infrastructure creation, and upgrades of a broad range of technologies.... the new regulations allow joint ventures with qualified Cuban tech entrepreneurs (both private individuals and cooperatives), as well as the import of their services to the United States... Often overlooked but of crucial importance to Cuba's ICT development, the US regulations permit US companies to engage in “infrastructure creation”—a seemingly innocuous change that could allow US investment in private sector ICT infrastructure such as fiber-optic cables and digital transmitters.”⁶

Recent developments concerning Cuba's ICT sector

Cuba has taken critical first steps over the past decade, ending restrictions on mobile phones and laptops, expanding construction of the fiber-optic cable network, and expanding the number of Wi-Fi hotspots and internet cafes throughout the island.⁷ Further, the Cuban government launched the first large-scale moves towards privatization in the ICT sector, inviting proposals for joint venture partners for ETECSA the sole fixed network operator on the island.⁸ Telecom Italia took a 27 percent interest in ETECSA through its subsidiary, Telecom Italia International.⁹ As these shares were later re-purchased by Cuba in 2011, ETECSA has regained its monopoly.¹⁰ Internet penetration currently reaches 74% of territory, but there is a slow rate of 2.4 kilobytes per second Internet speed and inadequate capacity.¹¹ Finally, over the past year, 180 Internet cafes have opened across the island, with another 150 planned. Also, 35 experimental Wi-Fi zones have recently opened in public parks in Havana and several other cities, requiring only an account with the Nauta mobile telephone email service offered by Etecsa.¹²

IV. Comprehensive ICT Development Plan

Improve connectivity to Cuba

Improving connectivity to Cuba is necessary for the long-term development of an internationally competitive ICT sector. The Alba-1 project that now connects Cuba to Venezuela and Jamaica via a submarine fiber optic cable was an enormous step forward, providing download speeds up to 3,000 times faster than the previous satellite-based network.¹³ Still, by international standards, network transmission speeds yielded by the solitary cable are prohibitive for the development of an ICT sector, and will require future investment to expand infrastructure. Additional fiber optic cable connections would provide much faster Internet services, greater redundancy, lower latency times, and additional capacity for emergency communication.¹⁴ There exists three options for expanding connectivity to Cuba: connecting to existing cables that

currently bypass Cuba, connecting to the Miami-Guantanamo Bay cable, and establishing a new submarine fiber-optic cable to connect Havana and Miami.

First, we have identified seven existing submarine fiber-optic cables that would provide the necessary expansion of connectivity and also lie in close proximity to Cuba: the CFX-1, AMX-1, BDSNi, SAm-1, ARCOS, Maya-1, and Fibralink cables.¹⁵ Connecting to any of these cables would amount to a relatively low-cost solution to expand connectivity. Most ideal are the SAm-1, and AMX-1 cables, due to the cables' proximity, capillarity, and ownership (Spanish and Mexican firms).¹⁶ We advise the Ministry to enter into negotiations with these firms to further evaluate the prospects for an agreement.

Second, we have given consideration to pursuing an agreement with the U.S. to connect to the Miami-Guantanamo Bay cable following statements from senior US military officials that suggested that "one day" the cable would "be for the entire island."¹⁷ However, we have assessed this option to be implausible and less desirable, given that later statements have contradicted this claim and the potential for the U.S. to use this leverage to extract future concessions.

Finally, we consider the potential for a laying a new submarine cable connecting Havana to Miami. This would be the most costly option, which we have estimated to be roughly \$30 million, but would also convey the most in terms of benefits.¹⁸ A dedicated cable, not shared by other Caribbean states, would provide the most bandwidth capacity and also a significant increase in speed over the Alba-1 cable.¹⁹ Almost all of Cuba's international Internet traffic already passes through the U.S. via Venezuela.²⁰ Thus, a direct connection would drastically reduce latency times and increase network speeds. However, given the high costs and pressing

needs in other areas of the network, we recommend this to be considered as part of 10-year plan rather than one for immediate consideration.

Improve connectivity within Cuba

Beyond improving connectivity to the island, the greatest barrier to the development of a viable ICT sector is the lack of infrastructure to support connectivity within Cuba.²¹ This challenge is two-fold. First, efforts must be undertaken to improve and expand the backbone infrastructure of Cuba's fixed network. This network currently consists of a patchwork system of outdated, low-capacity copper cable and a limited skeleton of fiber optical cable.²² Existing plans for expanding high-speed fiber-optic coverage include some 23 terminals stretching cable from San Jose to Santiago de Cuba.²³ We assess that the plan has not moved beyond its initial phases, and recommend immediate, large-scale investment to complete this infrastructure expansion. Further, we recommend replacing existing OLA and FOADM terminals with newer, more technologically sophisticated alternatives.²⁴ Converting those outdated terminals to ROADM or multi-degree ROADM hubs would create a more efficient and dynamic system. Beyond gaining added flexibility in future expansion of the network, adopting these newer technologies entails several benefits, including the capacity to support a higher volume of traffic, a considerable reduction in the price of delivering service, and a reduced need for OLA terminals.²⁵

Second, increasing connectivity will require expanding local access points to extend the network from the national backbone directly to users. Recent efforts to increase the number of cyber centers, Internet cafes, and Wi-Fi access points have begun to address this need²⁶, while the 2015 National Strategy for Broadband Development proposes the implementation of first-generation ADSL technology to eventually extend service through telephone landlines.²⁷

However, despite the initial progress, the lack of local connections continues to restrict access for large portions of the Cuban population.²⁸ We recommend continuing efforts to increase public access points, but advise prioritizing the expansion of Wi-Fi hubs. Wi-Fi access points have become increasingly popular relative to cyber centers and Internet cafes, and we expect this preference to become more stark as mobile phone and laptop penetration increases.²⁹

Additionally, telephone lines currently reach only a quarter of the population. Instead, we advise a more forward-thinking and cost-effective solution that would skip cable, and extend service to users primarily through wireless connections.

Increase accessibility for Internet users

Beyond deficiencies in telecom infrastructure, our assessment identifies two additional barriers for expanding Internet access and the eventual development of an ICT sector in Cuba: prohibitive pricing for service and a shortage of those devices needed for accessing the Internet. First, the price for accessing the Internet is well beyond the means for the average Cuban. A single hour of Internet service, currently priced at CUC 2.00, represents 8% of the average Cuban's monthly salary of CUC 25.00.³⁰ Unavoidably, these prices will need to be lowered in order to meet the targets outlined in the "National Strategy for Broadband Development." We recommend these price reductions take place immediately. Future improvements to infrastructure will help to offset some of the costs of providing service, as well as allowing users to make more efficient use of their time while connected to the network, thus lowering the real price for service. To further offset costs and determine a specific pricing model, we consider the potential for a public-private partnership with a reputable telecom provider, an option which we later explore in greater detail.

Second, the lack of ICT devices capable of accessing the network will continue to undermine efforts to expand access, albeit to a lesser extent than pricing concerns. Both in terms of quantity and quality, the penetration of mobile phones and computers is lacking.

Understanding the current budgetary constraints, we advise ETECSA to expand their current product line to include for sale low-cost mobile phones, tablets, and PCs. Of the low-cost producers we assessed, we recommend the Indian firm DataWind, which offers quality tablet computers for less than CUC 30³¹, dramatically less than the Huawei products currently sold in ETECSA run stores.

Maintain security and integrity of Internet

As the number of Internet users increases, efforts to monitor and filter online content will unavoidably become more difficult. Given Cuban concerns of foreign interference, cyber crime, and undesirable content, we understand the Ministry's preference to retain monitoring and filtering capabilities.³² Accordingly, we recommend future investment to maintain these controls.

While Avila Link, the filtering software currently in use may be adequate for limited traffic, we recommend the eventual adoption of more sophisticated filtering software and believe SmartFilter to be most appropriate for Cuba's needs. Currently used by Iran, Saudi Arabia, Sudan, and others, SmartFilter provides more comprehensive filtering capabilities, allowing the Ministry to block content on the basis of URL, content signature, keyword, IP address and/or domain name system.³³ We would recommend a content management strategy centered on keyword, HTTP-host, and DNS-filtering in order to balance cost and accuracy.³⁴ However, SmartFilter offers a high-degree of customization, and would allow the Ministry to proceed with as much caution or openness as is deemed to be appropriate.³⁵

Beyond filtering and blocking content, we recommend investments in Deep Packet Inspection hardware to regulate the speed of Internet traffic. Commercially available through companies such as Nokia, Siemens, and Allot Communications, DPI hardware would allow the Ministry to engage in throttling measures to selectively slow traffic to certain sites, and can act as an additional security buffer against attempts to circumvent content filters.³⁶ Further, in the event of national emergencies, extreme throttling can block Internet access altogether.³⁷

Despite these measures, inevitably, there will be methods to circumvent the filtering process. SmartFilter would reduce the methods and in some cases the effectiveness of those work-arounds, but no software or filtering method is impenetrable.

V. Identifying Partners: Financing,

Financing

Given the considerable expenditures outlined above and an already strained Cuban budget, we recommend Cuba seek assistance in financing the prescribed infrastructure expansion. We consider several options, including USAID, the Chinese Development Bank, and the World Bank.

First, with the slow disassembling of the U.S. embargo, a direct appeal to USAID would not only be possible, but quite likely to be granted, albeit for limited objectives. For years, the agency has sought to undermine the Cuban political system through various efforts characterized as democracy promotion. In 2015 alone, USAID amassed more than \$7.5 million in expenditures to these ends, including more than \$1.5 million on “digital democracy” programs to transfer electronic equipment.³⁸ Understanding the Cuban government's concerns of a potential opportunity for U.S. interference and espionage in the purchase or installation of telecommunication equipment, we advise restricting the request solely for the provision of

laptops, smartphones and other Internet capable devices designated for non-government employees, preferably to support education and medical initiatives already underway. As these programs issue grants, rather than loans, we believe there to be potential for a beneficial agreement to support increasing accessibility to the network and recommend Cuba enter into discussions with the Agency to determine if an acceptable agreement can be reached.

Second, given the extensive economic ties between Cuba and China, the Chinese Development Bank should be considered as a potential and even logical option for financial assistance in expanding infrastructure and building Cuba's capacity for filtering online content. In general, we assess the development-oriented approach of the Chinese Development Bank to be the most consistent with Cuban interests, in which there lies minimal risk for political coercion. Further, China has recently demonstrated its willingness to support Cuban development with the signing of more than 30 agreements to extend credit for various Cuban development projects.³⁹ While telecom or ICT infrastructure was not specifically among those agreements, it is worth noting that Chinese tech firms are already leading the efforts to build Cuba's Internet infrastructure, demonstrated by the central role played Huawei⁴⁰. While we remain cautious of exacerbating debt levels, our assessment of recent measures to restructure debt and an agreement with the Paris Club for additional debt forgiveness yields an acceptable debt/revenue ratio.⁴¹ Accordingly, we recommend requesting additional financial support, in order to finance efforts to expand connectivity within Cuba.

Finally, we identify the World Bank's International Finance Corporation (IFC) as another logical financier of infrastructure expansion, as this arm of the World Bank has already "financed \$1.5 billion and facilitated another \$330 million for 84 ICT projects in 32 low-income countries (mainly for the extension of mobile and data networks)."⁴² Currently, Cuba would need to first

apply and gain membership to the IMF before such a deal could be completed.⁴³ Accordingly, we recommend Cuba begin this processes immediately, expecting the review and approval process to take at least a year's time.⁴⁴ However, given the Cuban government's concerns over the IMF's structural adjustment program, we recommend proceeding with caution. We believe the IFC to be a more ideal option for financing later infrastructure expansion, namely the proposed submarine cable to connect Havana to Miami.

Public Private Partnerships

Telecom Italia at one point had a 27 percent interest in ETECSA through its subsidiary, Telecom Italia International.⁴⁵ However, it was re-purchased for \$750 million by Cuba in 2011, and Cuba regained its monopoly.⁴⁶ Today that could be sold to telecommunications corporate partner.

“Google...proposed to the Cuban government a way to skip cable and revolutionize the Internet infrastructure directly through Wi-Fi connections and cellular phones... Google's experiments with beaming internet connections from space could also save the cash-strapped Cuban government from investing in more ground-based fiber optic systems.”⁴⁷ In 2015, Google visited several times and eventually made a concrete proposal for the installation of some sort of wireless infrastructure, but that offer was rejected, perhaps for lack of trust in the US Government and Google.⁴⁸ Cuba must develop a mutually acceptable agreement with Google regarding the need for content filters if a partnership is to take place.

One Florida entrepreneur, Luis G. Coello, CEO and founder of Cuba Mobile, is seeking to expand a fiber-optic cable to Cuba.⁴⁹ “Two of the submarine fiber-optic “pipes” that bypassed Cuba are expected to be connected to the island within the next few years. A US company and has a license to lay a cable from Florida and has been seeking investors to launch the project.⁵⁰

Coello's company, as well as others, will continue to invest in Cuba and build more fiber-optic cables spanning between the two nations. In March, "one topic addressed was the possibility of a north-south undersea cable between the US and Cuba...there at least a half-dozen US and non-US proposals to construct the cable."⁵¹

Huawei, a Chinese telecommunications company, has been actively involved in doing business in Cuba's ICT sector. "On 6 November 2015, Huawei Technologies Co Ltd. Reported an agreement to market mobile devices, parts, accessories and to train repair personnel. The government of the People's Republic of China has extended substantial financial credits to the government of the Republic of Cuba."⁵² "On 1 February 2016, Republic of Cuba government-operated Empresa Nacional de Telecomunicaciones de Cuba S.A. (ETEC S.A.) reported that it would install broadband services within the area of Old Havana using equipment sourced from Shenzhen, People's Republic of China-based Huawei Technologies Co Ltd. (2015 revenues exceeded US\$28 billion)."⁵³ The pilot project to provide broadband services in the two neighborhoods of Old Havana was achieved through fiber-optic cables operated by Huawei.⁵⁴

"Huawei equipment was also used in the recent installation of 35 WiFi hotspots across the island.... Counting WiFi, "navigation rooms," Youth Clubs and hotels, there are now 683 public access points in Cuba, all of which reach the backbone."⁵⁵ "Cuba has turned to China, not the US, for Internet connectivity and equipment and is committed to doing so in the short term future. China played a major role in the financing and construction of the ALBA-1 undersea cable, which connects Cuba to Venezuela and Jamaica. It was reported that China lent Venezuela \$70 million to finance the cable, which was installed by a joint venture made up of Alcatel-Lucent Shanghai Bell and Telecomunicaciones Gran Caribe (TGC) -- TGC is a joint venture

between Telecom Venezuela (60%) and Cuban Transbit SA (40%), both state-owned companies”

“Cuba had awarded Huawei a contract to build a national fiber-optic network in the year 2000.”⁵⁶

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