

Ideas for Haiti's Internet Reconstruction

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Executive Summary

Haiti's Internet infrastructure lags behind that of the surrounding Caribbean region, as well as other emerging countries of similar size and population. Rebuilding and expanding Haiti's connectivity is crucial for sustainable, long-term economic development.

In the near-term, the most effective way to improve the Internet ecosystem is to create or help create an entity that is charged with investing in and growing Internet infrastructure. This entity could be a quasi-governmental agency, a non-profit, or a commercial consortium, but it should promote a competitive, free-market system and abide by some basic principles, including fair and equal interconnection access for interested parties, so that oligarchies are less likely to develop. This entity will likely use public funds—probably received through foreign assistance—to cover initial capital expenditures, which will dramatically reduce the costs for Internet providers to use the infrastructure and effectively build services on top of it. This should result in competition and lower costs for consumers.

The Haitian government should also consider policies for “going mobile,” by opening either WiMax or TV spectrum for wireless providers to use to give consumers Internet access. This wouldn't and can't replace radio and TV access—particularly for emergency response—but would take advantage of “white spaces,” which are unused portions of spectrum, for Internet connectivity.

In the longer term, Haiti should establish more robust domestic fiber networks that interconnect to the Dominican Republic and link to multiple undersea cables. This would provide Haitians greater Internet access and likely lower access prices in both Haiti and the Dominican Republic.

This paper first provides a briefing on the current Internet landscape in Haiti, then focuses primarily on shorter-term solution ideas for Internet access, and finally provides an overview of longer-term options in Appendix A.

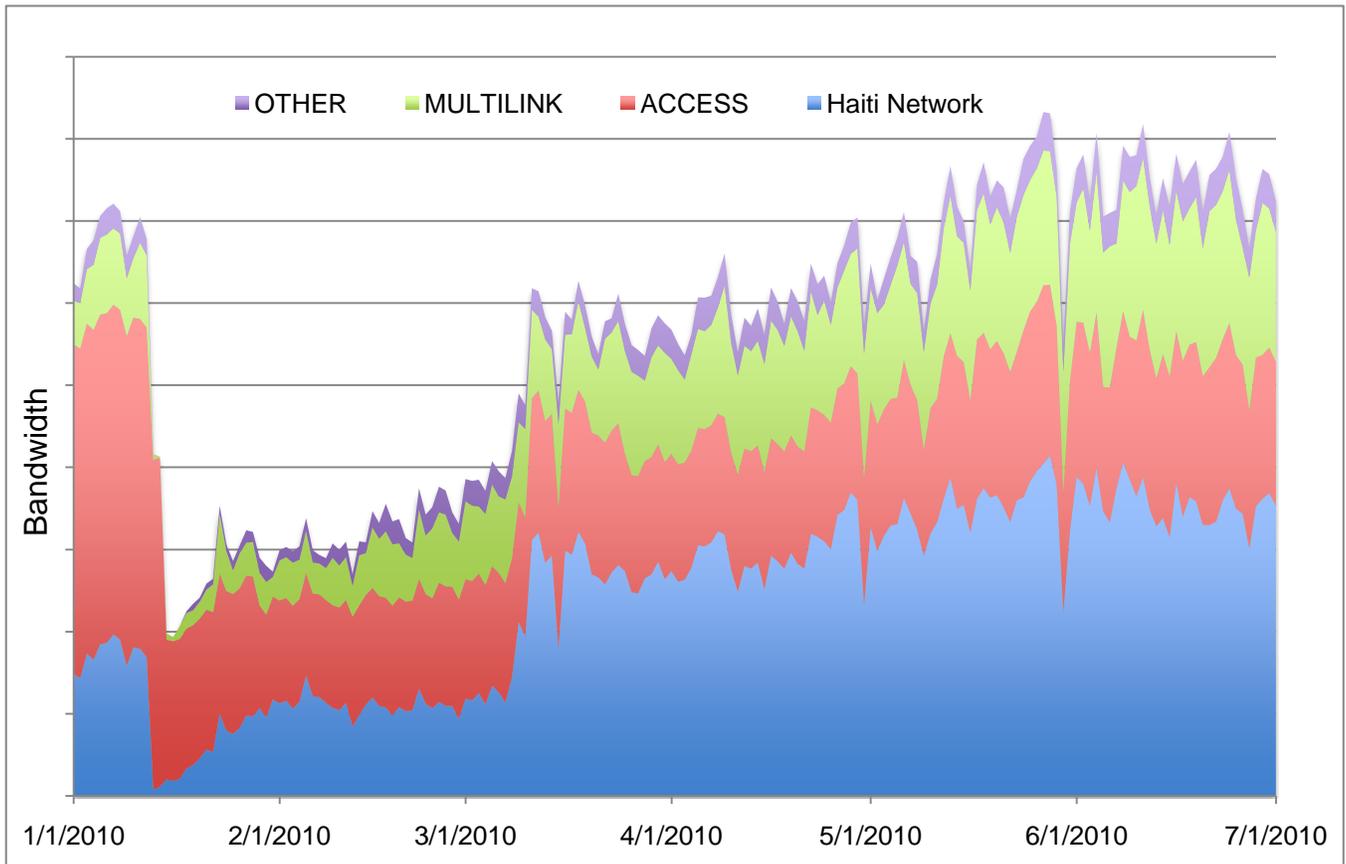
Current Internet Market Landscape in Haiti

A. Internet Service Providers in Haiti

There are three major established providers of high-speed Internet connections in Haiti today: Haiti Networking (or Hainet), Multi-Link and Access Haiti. Most of these companies provide Internet services within Port-au-Prince and surrounding areas, but to less of an extent in rural areas.

Figure 1 depicts Haiti's 2010 Internet usage, which peaked in the days before the catastrophic earthquake, then dropped to nearly zero on January 12th and has been steadily increasing ever since.

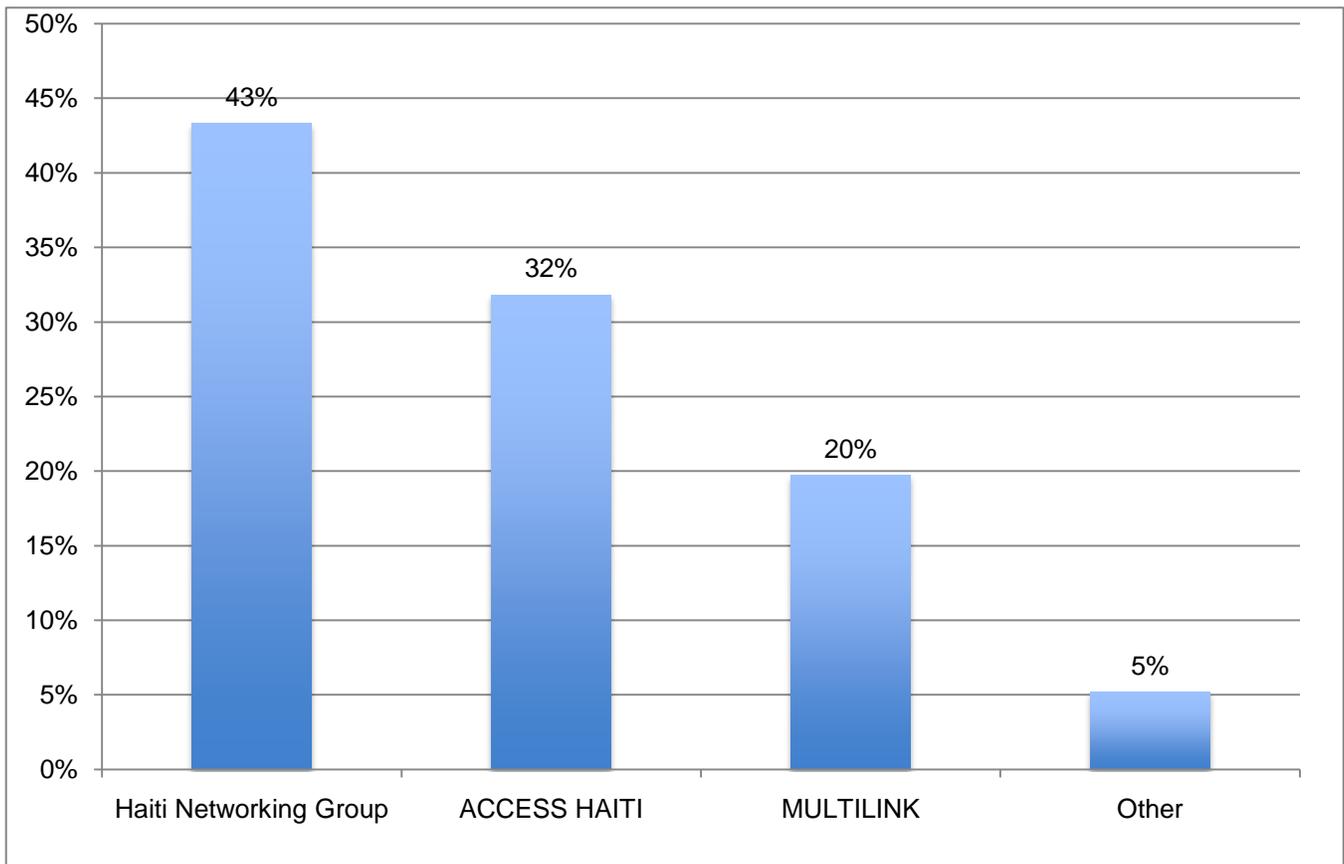
Figure 1: Internet Traffic in Haiti Across Internet Service Providers (2010 YTD)



Source: Internal Google data

Figure 2 shows the market share of the various Haitian Internet service providers (ISPs).

Figure 2: Market Share of Top Internet Service Providers in Haiti



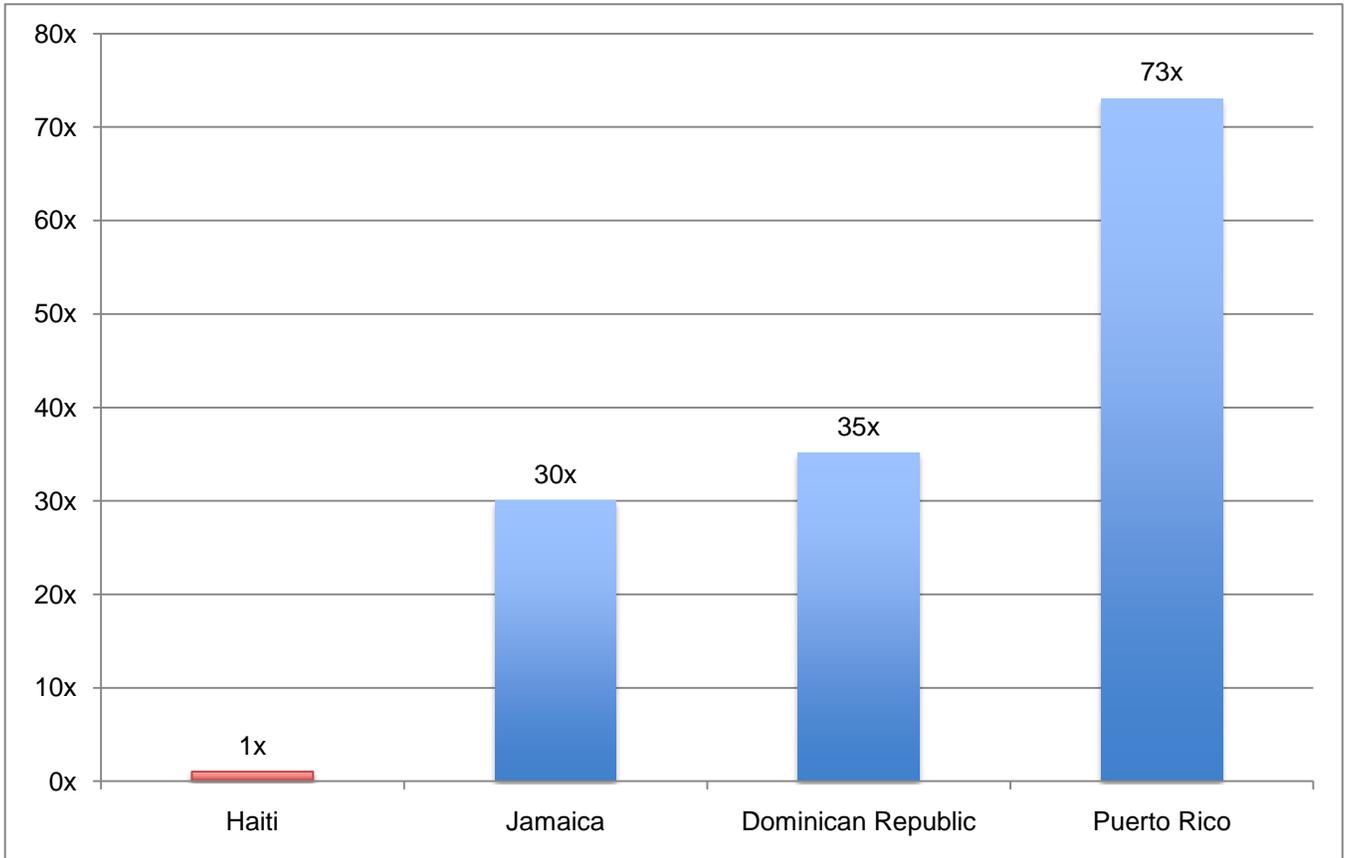
Source: Internal Google data

Note: "Other" is the sum of ISPs with fewer than 3% market share individually.

B. Internet Connectivity in Haiti Relative to Other Caribbean Countries

Two good measures of Haiti's connectivity are Internet bandwidth as compared to neighboring countries and market penetration rate, which is the number of Internet users as a portion of the total population. As Figure 3 demonstrates, Haiti's Internet bandwidth is much lower than in other Caribbean countries, and Figure 4 shows that its penetration rate is also lower relative to its neighbors.

Figure 3: Normalized Bandwidth Among Select Caribbean Countries

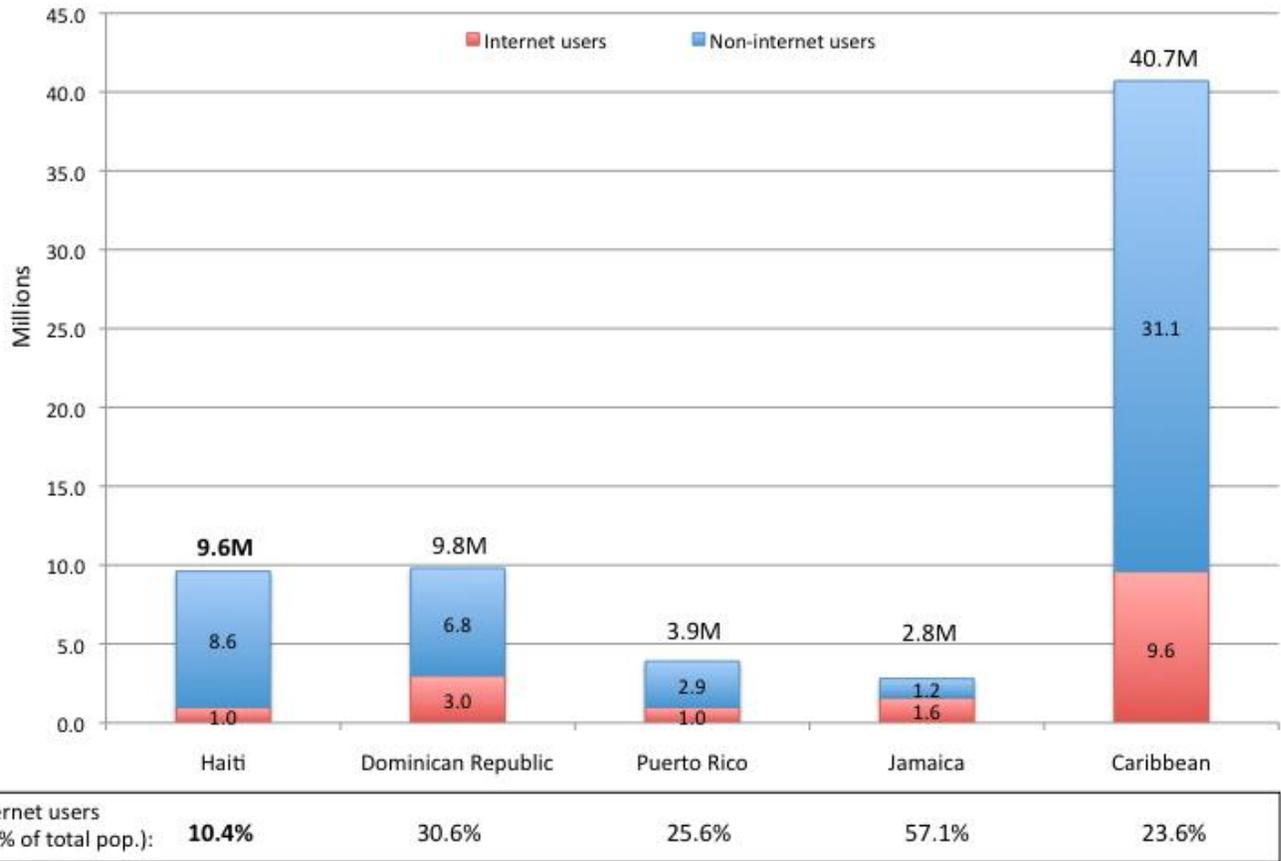


Source: Internal Google data

Note: The above table has been normalized to Haiti. For example, the Dominican Republic has approximately thirty-five times the bandwidth of Haiti.

Interestingly, Haiti and the Dominican Republic together have a population of approximately 19.5 million, which is 48% of the Caribbean's population. As a result, Hispaniola has an opportunity to establish the largest telecommunications market in the region.

Figure 4: Internet Users (as a portion of total population) in Select Caribbean Countries



Source: International Telecommunications Union

C. Existing Fiber Networks in the Caribbean Region

Haitian ISPs have already been linking to a fiber network in the Dominican Republic to an extent, with more connections planned. The white diamonds in Figure 5 below depict branching units, where new undersea cables can be attached (note the unit between Cuba and Haiti). In partnership with Columbus Networks, Alcatel is already lobbying the United States government to build out branches at these locations.

Figure 5: Illustration of fiber networks in the Caribbean and greater region



Source: Columbus Networks

Reconstructing Haiti’s Internet Infrastructure

Countries around the world have usually achieved high levels of Internet penetration via generally deregulated markets and landing cables to which all ISPs have fair and equal interconnection access. European—and particularly Nordic—countries provide a sustainable model that induces competition, creates jobs and lowers connectivity costs. Singapore has also created an ecosystem that encourages Internet penetration and, given its small size, could be an appropriate model for Haiti. See Appendix C for more details.

A. Challenges to Improving Haiti’s Internet Infrastructure

Countries generally face three problems when building or rebuilding Internet infrastructure:

- Costs: high capital expenditure requirements to build infrastructure;
- Revenue: low average revenue per user (ARPU), at least initially; and
- Regulatory: state-owned telecommunications companies that stifle competition or other restrictive government intervention like Internet taxes.

Haiti’s challenge is compounded by its relatively small population, which makes achieving scale efficiencies difficult. However, even all of these issues do not fully explain the low Internet penetration rates in Haiti. Mobile penetration in Haiti is only 30%, for example, while many similarly small and less technologically advanced Asian countries are at saturation levels.

B. Recommendations

The recommendations offered below represent a potential approach for re-building the Internet infrastructure in Haiti.

Various studies have suggested that a market-based, competition-enabling model (along with some regulatory reform), as opposed to a pure regulation-based model, can help alleviate the challenges listed above. The key elements of this model involve the following:

I. Policy Revisions

Haiti should consider “going mobile” from the beginning—as India and Indonesia have done—by not investing in landline infrastructure, other than those connections necessary to get Internet access to the country, like undersea cables and core infrastructure fiber, and instead either open WiMax or TV spectrum for wireless providers to use to give consumers Internet access. Neither of these policy changes would displace radio or TV service, but would take advantage of unused spectrum for Internet connectivity.

TV spectrum can travel long distances without much degradation, which enables deployment of very high speed (more than 150 Mbps) wireless broadband connections at very affordable costs. Manufacturers in Taiwan and other countries can manufacture affordable equipment for this spectrum. The U.S. Federal Communications Commission recently approved a plan to open unused portions of the TV spectrum for wireless broadband, a move that regulators and companies agree will allow for more powerful Wi-Fi networks with longer range. Other countries are likely to do so in the future as well. By being an early adopter of this approach, Haiti could become a leading example of this technology for the world to follow.

If opening up TV spectrum isn’t an option, the next best path forward is opening up the WiMax spectrum, which is what the Philippines and Malaysia have done. Though WiMax has already been deployed in some parts of Haiti, including Port au Prince, the government can help speed up deployment through the infrastructure creation policy outlined below. It’s an especially appropriate technology given that it was up and running immediately after the earthquake and available at normal market rates. It would likely have similar resilience after other natural disasters. It is important to note, however, that WiMax works best in densely or moderately populated areas, but is not as appropriate in rural regions due to cost and power consumption.

Tax policy that encourages investment in telecommunications infrastructure would also help rebuild Haiti’s Internet infrastructure.

II. Infrastructure Creation Policy

New infrastructure is critical to Haiti's Internet connectivity, and as a result, so is the structure for building it. The best option is likely an entity, in this paper referred to as "Netco," that could operate and finance the core telecommunications and Internet infrastructure network, including optical fibers, antenna towers, and the international network (which would be built out via undersea cables and more links to the Dominican Republic). Netco should operate on a cost-based, non-profit basis. Its success should be judged on increasing Internet penetration rates in Haiti, with progress transparently and regularly measured and published online.

As Netco would finance the capital costs of the new infrastructure, it would substantially lower the costs for new and existing operators and ISPs in Haiti. Operators and ISPs would share the core infrastructure, and lease access to it from Netco for a fraction of the expense that they otherwise would have spent had Netco not existed.

This would allow Internet operators to deploy quickly, and to substantially lower their breakeven costs on new investments. In turn, this low-cost business environment would invite more competition and bring down costs for consumers. Consumers would pay less and overall market size would increase. If examples from India are any indication, this policy change alone could increase mobile penetration from 30% to 70%, improving the profitability of the operators as well.

An increase in mobile penetration in particular would revolutionize the roll-out of mobile Internet and make the service very affordable. Mobile Internet is available today in India for \$2 per month. The telecommunications incumbents, including Digicel, Voila and Haitel, or any new entity, could lease a portion of the infrastructure from Netco to operate their respective network and offer Internet services.

Lastly, Netco would help build out the international network (see Appendix A for more information). Currently the international connectivity in Haiti is very expensive. Netco, with its cost-based, non-profit model and independent structure, would help significantly bring down the costs in the short-term and long-term by owning the international bandwidth to Haiti.

In the short term, collective buying by Netco from the Dominican Republic should result in lower costs. New connections are being planned, including broadband over power lines, which is a technology already in use in the Dominican Republic. It's important for these technologies to connect back to both of the Dominican Republic's undersea cables, which will encourage price competition. Longer term (five to ten years), a branch cable linking Haiti to one or ideally two existing undersea cables would likely be necessary to bring international connectivity costs down to reasonable levels. Connecting Haiti to the nearest undersea cable will likely cost tens of millions of dollars. Another option is a direct connection from Port au Prince to Miami, which would be more expensive and could also get caught up in environmental regulations given that there are so many cables that connect in Florida already. Longer-term, however, this probably provides more competition and would result in lower prices for consumers.

Implications for Haiti

Reconstructing Haiti's Internet infrastructure would create critical national and international linkages that would help foster and drive the country's economic development. Implications include:

- Potential for more decentralized development:
 - Enable rebuilding of labor-intensive businesses outside of Port-au-Prince (e.g. factories, business process outsourcing, call centers). Regional planners describe this as

“polycentric” development, which is the building out of areas with multiple centers of activity that can reduce vulnerability through differentiation and redundancy.

- Increased access to information:
 - Provide long-distance educational programming to hard-to-reach areas via efforts like distance learning initiatives.
 - Expand medical training and e-medicine to rural, hard-to-reach areas.
- Promotion of e-commerce:
 - Facilitate more consumer transactions and at lower cost, e.g. Nokia Listings for Emerging Markets.
 - Increase access to credit for small businesses and farmers.
- Attraction of direct foreign investment:
 - Develop a business process outsourcing and call center industry in the Eastern Standard Time zone.

Appendix A: Longer-Term Options

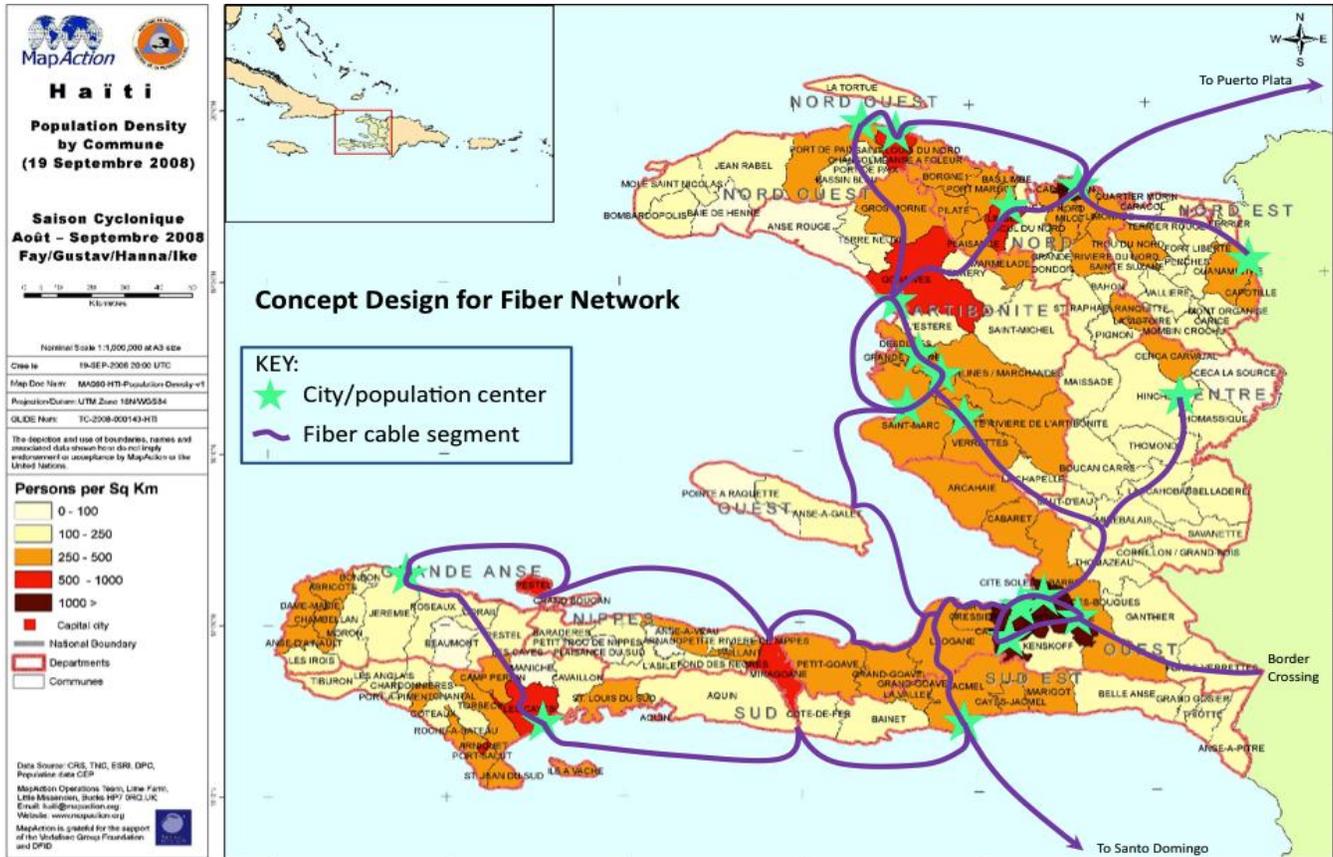
Establishing a robust domestic Haitian fiber network that interconnects to the Dominican Republic would tie together the two countries, allow Haitian ISPs/mobile providers better access to submarine cables in the Dominican Republic, and push prices lower in both markets.

Linking Puerto Rico to the Dominican Republic and Haiti would solidify the three countries as a market and the combined network as the hub of Caribbean telecom. Bringing in Puerto Rico could also create a stronger reason for the U.S. government to invest and be involved.

A new undersea cable to Haiti is possible, as the Columbus Networks system was designed with a nearby branching unit. This additional branch would provide Haiti with greater connectivity. Ultimately connectivity to Miami and access to the U.S. Internet backbone would deliver even greater cost reductions. Negotiating the cost of 10G channels from Port-au-Prince to Miami is the necessary next step. The undersea branch is one necessary sub-component, or a completely new submarine cable to Miami could be constructed as an alternative. Connecting to the Columbus Networks cable will probably cost tens of millions of dollars and a cable directly to Miami would be even more expensive.

In-country, Haiti should consider innovative network solutions for connectivity. Given the steep hills and mountains in the country, the design depicted in Figure 6 makes use of "festoon" submarine cables linking the coastal areas. By keeping the cables short—each cable segment is less than 100km—low-cost optical equipment such as Gigabit Ethernet switches can be used to light the fiber, instead of more expensive traditional telecommunications equipment. This low cost equipment is also energy efficient: sites can be powered by solar or wind to charge batteries.

Figure 6: Concept Design for Short Cable Fiber Network



Source: MapAction for the underlying map. Google created the concept design for the fiber network.

Because each cable segment provides incremental benefit, the fiber network does not need to be built as one massive national project. Instead, it could be built as a series of city-to-city links over time. The international connectivity via submarine cable stations or links to the Dominican Republic is key nodes on the network, and thus should be planned earlier than later.

The festoon cables concept needs further research and costs are unclear. However, there is some consensus that these cables would be cheaper than digging trenches through rock to cross the interior. Field engineering evaluation is necessary to plan the most economic routes.

Appendix B: Telecommunications Legal Landscape for Haiti

Created by decree in 1969, the National Council of Telecommunications (CONATEL) is Haiti's national regulatory body for telecommunications. In general, the telecommunications laws are outdated as most were created before the Internet. The laws can be found under the Legislation tab on CONATEL's website:

- Decree of October, 30 1969: created the National Telecommunications Counsel
- Decree October 12, 1977: granted the Haitian State a monopoly on telecommunication services, including the right to grant and limit licenses or operating permits
- Organic Law of 1987 and Taxation Law of 1987: redefined CONATEL's mission and fixed its authority in the planning, regulation and control of telecommunications

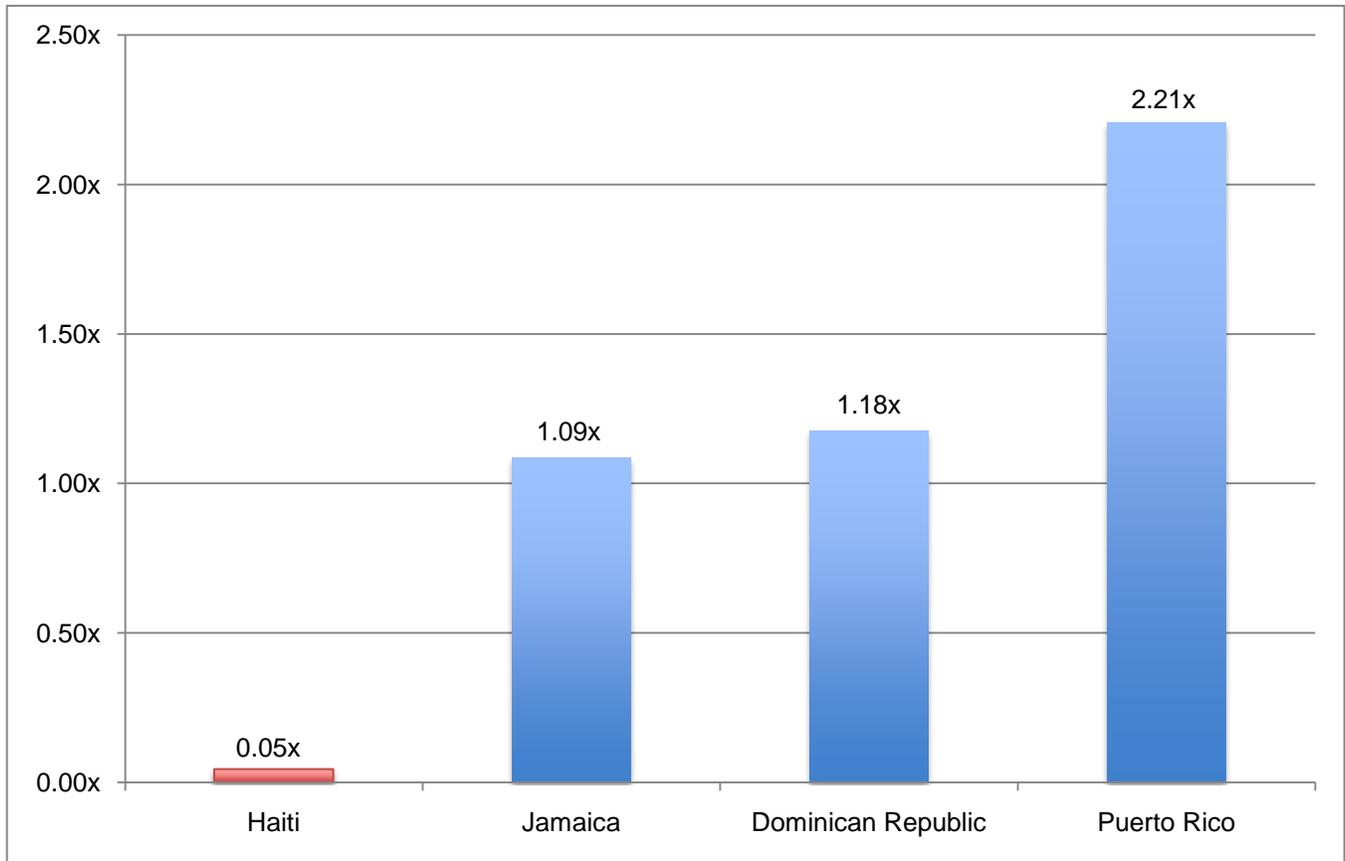
Appendix C: Selected Countries' Telecommunications Policies

Below are examples of three countries with progressive telecommunications policies and Internet ecosystems that may be applicable in Haiti. Other Latin American, South American and Caribbean countries have not generally developed markets and policy structures as robust.

- Singapore: Singapore is creating Netco type organizations and related policies for their new deployments. Details can be found at: www.ida.gov.sg.
- Indonesia: Indonesia is the first country in the world where the traffic from mobile devices exceeds the traffic from desktop/laptop computers. Details can be found at: metrics.admob.com.
- India: In India, legislation exists that encourages tower and other infrastructure sharing, which reduces costs to consumers. It took pressure to make this happen, however--industry participants were initially reluctant. Details can be found at: www.ictregulationtoolkit.org/en/PracticeNote.3157.html.

Appendix D: Selected Countries' Bandwidth per Capita

Figure 7: Bandwidth Per Capita Among Select Caribbean Countries



Source: Internal Google data

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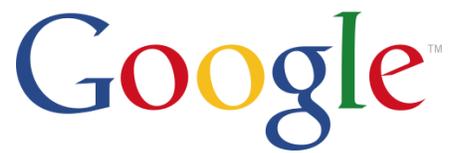
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