

Analysis of ITU Spectrum Recommendations in the Latin America Region

Understanding Spectrum Allocations and Utilization



August 2013

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EXECUTIVE SUMMARY

By June 2013, the Western Hemisphere (North, Central and South America and the Caribbean) had more than one billion wireless subscriptions, representing 16% of all subscriptions worldwide. The mobile markets in Latin America and the Caribbean share several characteristics. A common trait or thread throughout the region is a mobile penetration rate averaging (at year-end 2012) more than 100% at the regional level with at least five markets reporting over 130% mobile penetration, another five between 100% and 130% and the rest slightly below 100%. The region also shares a low fixed broadband penetration rate coupled with a growing base of consumers using smartphones and mobile broadband. The most common characteristic of the Latin America mobile broadband marketplace is the need for more internationally harmonized spectrum throughout the region. The solution to this need will allow continued progress of technology evolution to serve society's growing demand.

As North America considers AWS 1.7/2.1 GHz extension bands like 1755-1780/2155-2180 MHz and a new spectrum band in 600 MHz from the TV broadcast incentive auctions, it is extremely important for the Americas to work together for a harmonized spectrum plan. The region will benefit from the economies of scale and scope for the whole ecosystem of chipsets, devices and infrastructure, as well as LTE mobile broadband roaming. In Latin America, 850 MHz is the only common spectrum band that has been tendered in all markets within the region. However, the 1.9 GHz spectrum band has been assigned to most of the markets. Nine markets have been assigned tenders for AWS 1.7/2.1 GHz spectrum bands (1710-1755 matched with 2110-2155 MHz) and three have completed the allocation of 2.5 GHz (2500 MHz to 2690 MHz) spectrum for the provision of mobile wireless services. Additionally, some countries in the Americas are considering the 3.5 GHz spectrum band for mobile wireless. Unfortunately, none of these spectrum bandwidths have been fully assigned throughout the region.

Mobile Spectrum Allocations in Latin America

Spectrum Band MHz	700	850	900	1700	1800	1900	1700/2100	2100	1900/2100	2300	2500
Argentina	-	√	-	-	-	√	-	-	-	-	-
Bolivia	√	√	-	-	-	√	√	-	-	-	-
Brasil	-	√	√	-	√	√	-	-	√	-	√
Chile	-	√	-	-	-	√	√	-	-	-	√
Colombia	-	√	-	-	-	√	√	-	-	-	√
Costa Rica	-	√	-	-	√	-	-	√	-	-	-
Dominican Republic	-	√	√	√	√	√	-	-	-	-	-
Ecuador	√	√	-	-	-	√	√	-	-	-	-
El Salvador	-	√	√	-	-	√	-	-	-	-	-
Guatemala	-	√	√	-	-	√	-	-	-	-	-
Honduras	-	√	-	-	-	√	-	-	-	-	-
Mexico	-	√	-	-	-	√	√	-	-	-	-
Nicaragua	√	√	-	-	√	√	-	-	-	-	-
Panama	-	√	-	-	-	√	-	-	-	-	-
Paraguay	-	√	-	-	-	√	√	-	-	-	-
Peru	-	√	√	-	-	√	√	-	-	-	-
Puerto Rico	√	√	√	-	-	√	√	-	-	√	-
Uruguay	-	√	√	-	√	√	√	-	√	-	-
Venezuela	-	√	√	-	√	√	-	-	-	-	-

Source: Signals Telecom Consulting

Note: In the table above, Mobile Spectrum Allocations in Latin America, 11 frequencies are highlighted across 19 countries in the region. The 700 MHz spectrum allocations listed in Bolivia, Ecuador, Nicaragua and Puerto Rico corresponds to the Third Generation Partnership Project (3GPP) FDD bands 12, 13, 14 and 17. The 2500 MHz spectrum allocations listed in Brazil, Chile and Colombia refer to the FDD LTE band 7 of 2500-2570/2620-2690 MHz and the TDD LTE band 38 of 2570-2620 MHz.

There are several drivers behind government initiatives to allocate more mobile spectrum, the main one being the need to foster technological innovation through the deployment of new technologies. This will provide higher data throughputs enabling consumers the use of mobile broadband Internet services and video-centric applications. Another factor that contributes to a greater demand for spectrum is the evolution of Latin America's mobile market which increased from 60 million mobile subscribers in the year 2000 to 680 million in 2012.

The International Telecommunications Union Radiocommunication Report for Mobile, Radiodetermination, Amateur and Related Satellite Services 2078 (ITU-R M. 2078) establishes recommendations for the allocation of sufficient radio spectrum to allow for the proper development of IMT-2000 and IMT-Advanced.

Using the ITU spectrum requirement of 1300 MHz of total spectrum that is recommended for 2015 as a benchmark, the regional situation can be summarized as follows: five countries have allocated more than 300 MHz; nine are in the range between 200 MHz and 300 MHz, while the rest of the countries oscillate between 130 MHz and 200 MHz. Using the percentage of the ITU's recommendation as a different comparison, only three markets (Brazil, Chile and Colombia) approached 30% of those goals, five reached 20% (Costa Rica, Nicaragua, Puerto Rico, Peru and Uruguay) and the rest are between 10% and 20%.

There is interest by many country regulators to auction more spectrum, and this is taken into consideration in this white paper. Even after taking into account these allocations, there is still a shortage of harmonized international wireless spectrum in the region. Thus, regulators must move from "interest" and "planning" into the "action" of auctioning off more spectrum. Most regional regulators have expressed interest in auctioning 700

MHz spectrum in the near future. The main obstacle faced by many of them is guaranteeing that these frequencies are free from interference and that, where appropriate, are available after migrating analog TV signals to digital format to liberate spectrum to obtain what is commonly called the digital dividend. This band (700 MHz) could also become an opportunity to assign a commonly harmonized spectrum throughout the region.

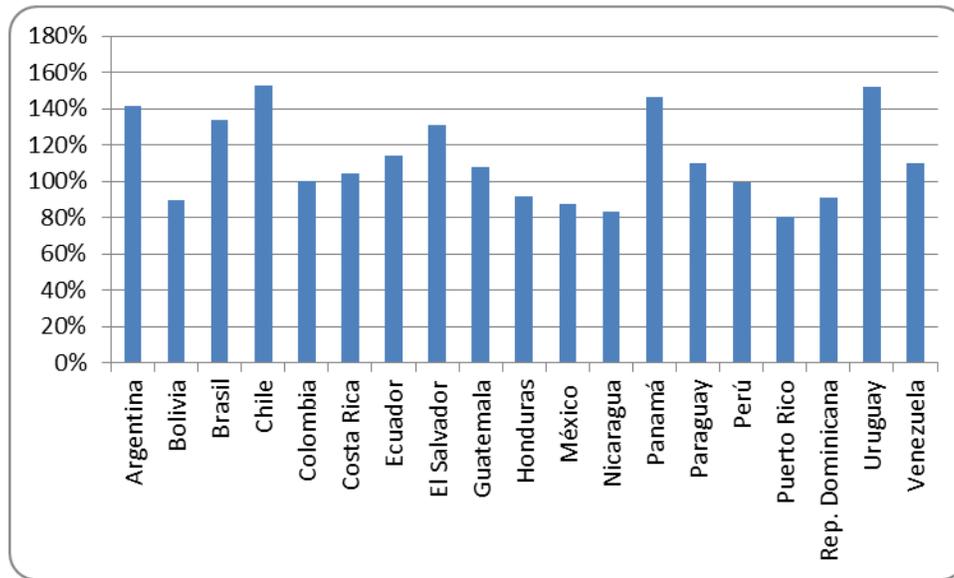
Spectrum licensing postponement could be considered detrimental to market developments and could limit the inflow of investment as license winners will have to invest not only in acquiring spectrum, but also on infrastructure, devices, operational and administrative costs, and advertisement.

Regulators throughout Latin America must continue to be diligent in understanding the importance to their citizens by bringing more spectrum to the market in order to propel economic growth and overall connectivity in their country. Several studies have shown that investment in mobile broadband has a positive impact on GDP. Mobile broadband is capable of closing the digital divide and offering new transformational opportunities in the areas of education, health, government and transportation. This is especially important in rural and remote areas where the wired infrastructure of the fixed telecom service providers are not present, making wireless technologies the only viable alternative to offer broadband services to the population in favor of reducing the digital divide gap.

INTRODUCTION

Latin America and the Caribbean mobile markets share several characteristics. A common trait or thread is a mobile penetration rate averaging (at year-end 2012) more than 100% at the regional level with at least five markets reporting over 130% mobile penetration, another five between 100% and 130% and the rest slightly below 100%.

Latin America & Caribbean Mobile Penetration, 4Q12



Source: Signals Telecom Consulting

All markets currently have UMTS/HSPA networks commercializing services with most operators already offering some sort of mobile broadband option. The exceptions to this general trend are a few iDEN operators that are either in the process of deploying 3G/4G technologies or waiting for the allocation of mobile spectrum to start their migration towards 4G technologies.

850 MHz is the only common spectrum band that has been tendered in all markets of the region. However, the 1.9 GHz spectrum band has been assigned in most markets. Only nine markets have assigned tenders for AWS 1.7/2.1 GHz spectrum bands and three have completed the allocation of 2.5 GHz (2500 MHz to 2690 MHz) spectrum for the provision of mobile services. Unfortunately, none of this bandwidth has been fully distributed throughout the region.

There are several drivers behind government initiatives to allocate more mobile spectrum, the main one being the need to foster technological innovation through the deployment of new technologies. This will provide higher data throughputs enabling consumers the use of mobile broadband Internet services and video-centric applications. For this to be efficiently accomplished, operators have to maintain separate networks (each with their own spectrum bandwidth requirements) with different technologies.

Another factor that contributes to a greater demand for spectrum is the evolution of Latin America's mobile market that increased from 60 million mobile subscribers in the year 2000, to 680 million in 2012. During the same period of time, mobile usage evolved from being voice-centric to the use of advance data applications and mobile broadband services. This trend will continue in the future with mobile broadband representing 68% of all mobile lines by 2017, which according to Cisco, will represent 723 petabytes of traffic up from 55 petabytes at the end of 2012.

Mobile Broadband Forecast in Latin America (HSPA-LTE)

	December 2012	December 2017
Total Subscriptions	680 Million	858 Million
Mobile Broadband	113 Million (17%)	581 Million (68%)

Source: Informa Telecoms & Media 2013

ITU MOBILE SPECTRUM RECOMMENDATIONS

The International Telecommunications Union Radiocommunication Report ITU-R M.2078¹ published in 2006 established recommendations for the allocation of sufficient radio spectrum to allow for the proper development of IMT-2000 and IMT-Advanced. In this regard, ITU aims to help government authorities in the allocation of spectrum efficiently so as to allow the expansion of mobile broadband services.

Report ITU-R M.2078 was developed in preparation for WRC-07 Agenda Item 1.4. In the currently underway preparation for WRC-15 Agenda Item 1.1², the ITU-R in its Working Party 5D is presently developing an updated view of the future spectrum estimate. The work on draft new Report ITU-R M.[IMT.2020.ESTIMATE] utilizes Recommendation ITU-R M.1768-1 and builds upon Reports ITU-R M.2072, ITU-R M.2074, ITU-R M.2078 and especially ITU-R M.2243. Nonetheless, Report ITU-R M.2078 continues to offer guidance until an updated view is available with the completion, approval, and publication by ITU-R of the new Report ITU-R M. [IMT.2020.ESTIMATE] in late 2014/early 2015.

Report ITU-R M.2243³ published in 2011 reviews both the market and traffic forecasts for International Mobile Telecommunications (IMT) that were developed in previous study periods (extending from 2000-2007) and assesses the current perspectives and future needs of mobile broadband that would be supported by IMT over the next decade (2012-2022). It also presents new traffic forecasts provided by a number of industry sources for the forecast up to 2015 and one source for the forecast between 2015 and 2020 taking into account new market trends and market drivers.

Based on Report ITU-R M.2243 and other new forecast information, it is anticipated that the future estimated total spectrum requirement currently being assessed will likely in year 2020 surpass the view expressed in Report ITU-R M.2078.

The ITU-R M. 2078 recommendation is given in the context of increasing pressure on mobile operators' networks from the rapid increase in mobile data traffic, which takes place globally thus, the ITU set a minimum amount of spectrum allocated for IMT-2000 and IMT-Advanced, for the years 2010, 2015 and 2020 depending on the market development status: lower market setting vs. higher market setting. The ITU recommendation

¹ [Report ITU-R M.2078 \(2006\)-Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced](#)

² World Radio Conference (WRC-15) Agenda Item 1.1: *“to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 [COM6/8] (WRC-12)”*

³ [Report ITU-R M.2243 \(2011\)-Assessment of the global mobile broadband deployments and forecasts for International Mobile Telecommunications](#)

classifies the spectrum requirements by Radio Access Technology Group (RATG). RATG 1 covers pre-IMT and IMT, as well as enhancements to IMT, and RATG 2 is comprised of IMT-Advanced.

ITU Recommended Spectrum Allocation for Deployment of IMT & IMT-Advanced Technologies⁴

Market Setting	Spectrum Requirement for RATG 1 (MHz)			Spectrum Requirement for RATG 2 (MHz)			Total Spectrum Requirement (MHz)		
	2010	2015	2020	2010	2015	2020	2010	2015	2020
Higher market setting	840	880	880	0	420	840	840	1300	1720
Lower market setting	760	800	800	0	500	480	760	1300	1280

Source: International Telecommunications Union (ITU-R M. 2078)

The target spectrum allocations represent the total amount of spectrum in a given country market. These ITU recommendations allow the mobile operators to meet the growing demands of society that are using connected devices at an increasing rate. Many analysts predict 1200% increases in global aggregate mobile data traffic over the next five to six years. New services and applications, new devices and continued increases in using smartphones, tablets and connected machines are affecting all areas of subscribers’ lives including government, education, transportation and health.

⁴ This information from Report ITU-R M.2078 is being updated in a new ITU-R Report in preparation for WRC-15.

LATIN AMERICA'S SPECTRUM LANDSCAPE

Signals Telecom Consulting surveyed the spectrum allocation of 19 Latin America and Caribbean markets. The findings of this research show that in a best case scenario, only 39% of the target spectrum allocation for 2015 has been met. The need for additional spectrum allocation is demonstrated by the launch of LTE networks throughout the region in new spectrum as shown in the table below. The corresponding FDD LTE frequency bands as defined by 3GPP for LTE commercial mobile networks are: bands 12, 13, 14 and 17 for 700 MHz commonly referred to as the U.S. 700 MHz spectrum band plan; band 10 for 1710-1755/2110-2155 MHz commonly referred to as AWS; and band 7 for 2500 MHz (2500-2570/2620-2690 MHz). Most commercial LTE mobile services based in these markets held an auction process in the recent past.

Commercial Mobile FDD LTE Networks per Market, July 2013

LTE Networks per Market, July 2013			
Markets	Networks	Spectrum Band	Operators
Argentina	-	-	-
Bolivia	1	700 MHz	Entel Movil
Brazil	4	2500 MHz	Claro, Oi, TIM & Vivo
Chile	1	2500 MHz	Claro
Colombia	1	2500 MHz	UNE
Costa Rica	-	-	-
Dominican Republic	2	1900 MHz	Orange & Tricom
Ecuador	-	-	-
El Salvador	-	-	-
Guatemala	-	-	-
Honduras	-	-	-
Mexico	2	1700/2100 MHz	Movistar & Telcel
Nicaragua	-	-	-
Panama	-	-	-
Paraguay	2	1700/2100 MHz & 1900 MHz	Vox & Personal
Peru	-	-	-
Puerto Rico	5	700 MHz / 850 MHz / 1900 MHz 1700/2100 MHz	AT&T, Claro, Open Mobile, T-Mobile & Sprint
Uruguay	1	1700/2100 MHz	Antel
Venezuela	-	-	-

Source: 4G Americas, Signals Telecom Consulting

It is important to understand that the Latin America region has distinct characteristics from other areas of the Western Hemisphere. Regionally, Signals Telecom Consulting estimates the 1Q13 monthly average revenue per subscriber to be US\$10.59. Internet connectivity has been low and the regional GDP per capita in 2012 was approximately US\$9,000 according to the World Bank. Thus, bringing new spectrum to the market allows mobile operators to increase network capacity efficiently to support the new world of connectivity where today's smartphones use 35 times more spectrum than traditional cell phones and tablets use 121 times as much spectrum. Furthermore, various technology and economic studies have shown that increases in mobile broadband penetration and higher throughput speeds increases GDP and employment (Ericsson, Arthur D. Little, and Chalmers University of Technology). A 2011 wireless technology and investment report from Credit

Suisse showed Latin American networks at threshold utilization levels and forecast increased congestion (Credit Suisse, July 2011).

Using the 1300 MHz ITU recommendation for 2015 as benchmark, the regional situation can be summarized as follows: two markets have allocated more than 400 MHz; five markets are in the range between 300 MHz and 400 MHz; nine are in the range between 200 MHz and 300 MHz allocated, while the rest oscillate between 130 MHz and 200 MHz. Using the percentage of the ITU's recommendation as a different comparison, only three markets (Brazil, Chile and Colombia) have met 30% of those goals, five have reached 20% (Costa Rica, Nicaragua, Puerto Rico, Peru and Uruguay) and the rest are between 10% and 20%. As a region, Latin America has only allocated 19.8% of the spectrum bandwidth recommended by the ITU for 2015.

Percentage of Spectrum Allocated per ITU Recommendation for 2015 & 2020

Market	Percentage of ITU Recommendation 2015 completed	Percentage of ITU Recommendation 2020 completed
Argentina	14.62%	11.05%
Bolivia	13.85%	10.47%
Brazil	38.65%	29.22%
Chile	30.38%	22.97%
Colombia	31.73%	23.98%
Costa Rica	20.05%	15.15%
Dominican Republic	16.49%	12.47%
Ecuador	13.85%	10.47%
El Salvador	15.69%	11.86%
Guatemala	16.20%	12.24%
Honduras	13.08%	9.88%
Mexico	18.70%	14.13%
Nicaragua	20.15%	15.23%
Panamá	10.00%	7.56%
Paraguay	16.92%	12.79%
Peru	23.38%	17.67%
Puerto Rico	25.90%	19.58%
Uruguay	20.77%	15.70%
Venezuela	15.69%	11.86%
Regional Average	19.80%	14.96%

Source: Signals Telecom Consulting

There are two developments impacting the amount of spectrum allocated in Latin America's regional markets. The first development concerns the direct allocation of spectrum. Since 2000, there has been an increase in the number of spectrum directly allocated (without spectrum auction process) to state-owned companies. As of 1Q2013, eight markets have allocated spectrum to a state-owned operator: Argentina, Bolivia, Costa Rica, Ecuador, Honduras, Paraguay, Uruguay and Venezuela. However, the amount of MHz allocated is dissimilar as it varies between 30 MHz and 130 MHz.

The second development is allocated spectrum that remains unused in a timely fashion. The allocation of more spectrum to service providers must address the highest and best use of spectrum. It is understood that there are legitimate reasons which exist for operators' decisions to postpone deployment of mobile services in a spectrum band: awaiting finalization of technology standards or interference issues. In recent years, it has become evident in Latin America that some allocated spectrum from regulators presently remains unused. Examples of these include: license holder Viettel in Peru obtaining awarded spectrum in the beginning of 2011, state operator Arsat in Argentina receiving spectrum from the government in September 2012 and CNT in Ecuador acquiring allocated spectrum in December 2012. These instances should not preclude the overwhelming perspective that significantly more radio spectrum is needed throughout the Latin America region.

LATIN AMERICA'S SPECTRUM ALLOCATION FUTURE

Although the maximum amount of spectrum allocated only represents 39% of the 2015 ITU recommendation, during the next 12-18 months, several spectrum licensing processes are expected to take place in various markets of the region. This constitutes a first step in enabling mobile networks to decrease their level of congestion and increase mobile broadband services to reach higher levels of quality.

The most recent spectrum auction held in Latin America and the Caribbean took place in Peru in July 2013. This auction offered spectrum licenses for the 1.7/2.1 GHz (also known as Advanced Wireless Services or AWS). Peruvian authorities also announced their intentions of auctioning in a later process spectrum in the 700 MHz and 2.3 GHz bands.

Another market announcing its plan to conduct a spectrum auction is Paraguay, where the regulatory authorities intend to auction AWS licenses. The Dominican Republic also intends to conduct an auction of the AWS band during 2013 together with spectrum in the 941-960 MHz. This auction in the Dominican Republic has already been postponed for more than a year due to various regulatory issues. Chile is expected to begin the auction and bidding of 700 MHz licenses in August 2013 to allow operators to complement their current 2.5 GHz LTE networks.

Both Bolivia and Ecuador recently allocated spectrum to the state-owned operator for the deployment of 4G mobile broadband technologies, already commercial in Bolivia's case, but have yet to announce the date for an upcoming auction process where other companies are allowed to participate.

Nevertheless, most regional regulators have expressed interest in auctioning 700 MHz spectrum in the near future. The main obstacle faced by many of them is guaranteeing that these frequencies are free from interference and where appropriate, are available after migrating analog TV signals to digital format to liberate spectrum to obtain what is commonly called the digital dividend spectrum.

Mexico and Brazil are two markets where regulatory authorities have been very active in guaranteeing that enough 700 MHz spectrum bandwidth is available to allocate for the provision of mobile broadband services. In fact, Mexico has recently approved a mostly unproven "national wireless wholesaler" regulatory model for the 700 MHz spectrum band.

When considering the spectrum allocations, regulators should account for the positive benefits of harmonized spectrum including economies of scale, lower device and consumer costs and improved roaming. New spectrum allocations should configure licenses with wide bandwidths, contiguous spectrum, no interference and with a grouping of other similar services.

Participation in many of these upcoming spectrum auctions may be limited, possibly hindering investment and economic growth, due to the current spectrum caps that are in place in eight regional markets as shown in the table below.

Latin America's Mobile Spectrum Cap, July 2013

Market	Spectrum Cap	Notes
Argentina	50 MHz	Spectrum currently allocated
Bolivia	None	Spectrum currently allocated
Brazil	85 MHz	Excludes 450 MHz or 2.5 GHz
Chile	60 MHz	Only applies for AWS spectrum in combination with 850 MHz & 1.9 GHz
Colombia	115 MHz	85 MHz for > 1 GHz & 30 MHz for < 1 GHz
Costa Rica	None	Spectrum currently allocated
Dominican Republic	None	For AWS 40Mhz
Ecuador	65 MHz	Spectrum currently allocated. Doesn't apply for CNT AWS or 700 MHz spectrum
El Salvador	None	Spectrum currently allocated
Guatemala	None	Spectrum currently allocated
Honduras	None	Spectrum currently allocated
Mexico	80 MHz	Spectrum currently allocated
Nicaragua	None	Spectrum currently allocated
Panama	None	Spectrum currently allocated
Paraguay	None	Spectrum currently allocated
Peru	40 MHz + 60 MHz	60 MHz for 800 MHz, 900 MHz & 1900 MHz 40 MHz for 1.7 GHz / 2.1 GHz
Puerto Rico	None	Spectrum currently allocated
Uruguay	None	Spectrum currently allocated
Venezuela	None	Spectrum currently allocated

Source: Signals Telecom Consulting

SPECTRUM LICENSING CHALLENGES

It is not a secret that in many markets the current macroeconomic conditions do not present a favorable outlook for radio spectrum auctions in Latin America. Economies throughout the world are still slowly recovering from the recessionary pressures that began with the global financial crisis in 2008. Hence, licensing postponement has become a possibility in Latin America as governments are trying to avoid the problems such as lower than expected bids or simply absenteeism from the process.

Of course spectrum licensing is not as simple as it may appear from far away, as many interests, both internal external, are at stake on this process. Undoubtedly, spectrum licensing needs to continue in a region with asymmetrical wireless technologies adoption rates.

One point where no divergence exists among governments, operators, vendors and industry associations is the spectrum-licensing postponement which has become detrimental to market development:

- Limits the inflow of investment, as license winners will have to invest not only in acquiring spectrum, but also on infrastructure, operational and administrative costs and advertisement. Besides the statistical negative impact on GDP, the immediate social impact is the non-creation of numerous direct and indirect jobs in a region characterized by high rates of unemployment.
- It may create congestion on the spectrum auction schedule, as the national regulatory agencies will have to determine how the postponement will affect the rest of their spectrum auction schedule. Regulators will have to either prioritize which spectrum licenses to auction first or risk the fact of running simultaneous auctions for different spectrum bands. Since many operators have expressed interest in acquiring licenses on different portions of the spectrum, the lack of a coherent schedule will undoubtedly limit the number of parties submitting bids during the auction process as financial constraints will force companies to “pick and choose” which licenses it wants to acquire.

Regulators in the region should focus on creating fair and transparent auctions that support investment in networks and enable the deployment of mobile access technologies and their integration on public policy programs that foster the adoption of ICTs.

Moreover, the government’s decision to conduct 2.5 GHz and AWS spectrum auctions presents an opportunity for other markets in the region to enable economic scale for LTE services on these bands throughout Latin America and the Caribbean. As digital TV gains ground on the region and analog networks begin to be phased out, more spectrum in 700 MHz will be made available (i.e. digital dividend spectrum) and allocated to the different market players.

CONCLUSION

The ITU-R M.2078 established minimum spectrum allocation requirements to allow IMT-2000 and IMT-Advanced function optimally. However, no Latin American market has reached at least 50% of the 1300 MHz recommendation for the year 2015. The lack of sufficient spectrum for the development of these services has negative consequences on consumers and limits the growth potential of the telecommunications industry. Without more spectrum, the technological development of meeting society's growing broadband needs is at risk as broadband connectivity is critical for a country's progress. More internationally harmonized spectrum is needed throughout the region.

Only three markets in Latin America have allocated more than 30% of the ITU recommendation for 2015: Brazil (38.65%), Chile (30.38%) and Colombia (31.73%). These countries have also made announcements of their intentions of auctioning more spectrum bandwidth in the 700 MHz band before 2015. Some of the countries with the least amount of spectrum allocated have yet to announce a date for the next licensing process to occur in their market – Argentina (14.62%), Ecuador (13.85%), Honduras (13.08%), and Venezuela (15.69%).

The ITU is not alone in their call for more spectrum; most studies performed regarding spectrum requirements showcase the need for more spectrum. A 2007 NGMN study determined that net spectrum requirements would be between 500 MHz and 1 GHz by 2020, depending on the global region. In the United States, a 2010 National Broadband Plan developed by the United States Federal Communications Commission called for 500 MHz of new spectrum to be allocated by 2020. Governments in some countries in the world are leading their economies by realizing that today's spectrum parallels the need for roads, railroad lines, airports, water and sewer infrastructure of years past. Spectrum is a key ingredient for the development and progress of society just as water, sewer and roads have been in the past.

A result of more spectrum allocation would be the efficient performance of mobile networks, especially in high densely populated urban areas where spectrum constraints are compounded by other restrictions such as tardiness in the authorization of new tower deployments or deployment of new technologies. For example, LTE will become more efficient in spectrum use. It should be highlighted that in many instances, new spectrum is preferred for the deployment of new technologies as the already allocated bandwidth is being used by mature mobile technologies such as GSM or UMTS/HSPA+.

The highest numbers of new LTE deployments in the world have been when operators gain new spectrum and deploy LTE services in their new band. Technologies such as LTE benefit from wider radio channels. These wider radio channels are not only spectrally more efficient, but offer greater capacity. With ARPU's in the region averaging US\$10.59 per month, limited CAPEX and tower citing bureaucracy delays; bringing new spectrum to the market is the most efficient way forward for operators to deploy new technology and increase the performance of their networks.

Furthermore, allocation of spectrum to dedicated data channels may allow mobile operators to offer better mobile broadband throughput speeds, thus increasing consumer satisfaction as well as government objectives of expanding broadband coverage in their markets. Lack of robustness of mobile broadband connections delays the adoption of advanced applications that aim to solve educational, health, transportation and government services coverage problems.

In a 2011 study by Ericsson, Arthur D. Little and Chalmers University of Technology, 33 OECD countries quantified the isolated impact of broadband speed, showing that doubling the broadband speed for an economy increases GDP by 0.3%. A 2010 study by the Broadband Commission showed that for every 10 percentage point increase in broadband penetration, a country's GDP is increased by 1 percent. An ITU 2012 study indicated that for every 10 percentage point increase in broadband penetration, has had a direct impact on

efficiency (up to 3.6% increase according to the University of Ohio) and economic growth (between 1.21% and 1.36% increase in GDP according to the World Bank).

Regulators throughout Latin America must continue to be diligent in understanding the importance of their citizens by bringing more spectrum to the market in order to propel economic growth and overall connectivity in their country. This is especially important in rural and remote areas where the wired infrastructure of the fixed telecom service providers is not present, making wireless technologies the only viable alternative to offer broadband services to the population. It is extremely important for the Americas region to work together for a harmonized spectrum plan for the entire region to benefit from the economies of scale and scope for the whole ecosystem of chipsets, devices and infrastructure, as well as LTE mobile broadband roaming.

ARGENTINA

General:

Argentina has a population of 40,997,096 inhabitants. In 2012, the country reported a 141.52% mobile penetration rate in a market with three mobile operators (Claro, Movistar and Personal), an iDEN provider (Nextel) and a MVNO owned by rural cooperatives (Nuestro).

Mobile spectrum allocation in Argentina is divided into three areas: the major metropolitan area of Buenos Aires or AMBA, the North (highly densely populated provinces) and South (sparsely populated Patagonian provinces). Each region currently possesses a spectrum cap of 50 MHz.

Since 2007, Argentina has had several UMTS/HSPA+ networks, with all facilities-based operators, expressing interest to eventually invest in LTE infrastructure to provide high speed mobile data services in the country. In addition, Argentinean operators have mentioned LTE's spectrum efficiency as one of the reasons behind their interest in deploying this technology in a market that is experiencing rapid adoption of smartphones by consumers (17% penetration at the end of 2012). Higher smartphone penetration will lead to an increase in the use of mobile video applications and other OTT services. This will rapidly increase the amount of data traffic carried over the operators' networks.

ITU and Future Spectrum Plans:

The 190 MHz currently allocated in Argentina represents 25% of the recommended amount stated by the ITU-RM 2078 for 2010 and only 14.6% of the ITU recommended amount of spectrum allocation for 2015.

Compared with other Latin American countries, the government's approach to spectrum management shows a delay in the awarding of new licenses. The last spectrum auction process to take place in Argentina was held in July 1999 when six regional licenses were awarded to the mobile operators that are currently offering services in the market. After the licensing process of the late 1990s, the total amount of spectrum awarded in Argentina amounted to 190 MHz.

During 2012, Argentina's government announced its intention to make more spectrum bandwidth available to allow for the deployment of 4G technologies but on December 2012 the government published the Decree 2426/2012 granting just to the state-owned ARSAT spectrum in all three operating regions (excluding the rest of the operators):

- Region I: 30 MHz in the 1900 MHz band
- Region II: 30 MHz in the 1900 MHz band & 7.5 MHz in the 850 MHz band
- Region III: 35 MHz in the 1900 MHz band

No further announcements have been made on this subject by Argentinean authorities.

BOLIVIA

General:

Bolivia has a population of 10,299,000 inhabitants. In 2012, the country reported an 89.84% mobile penetration rate in a market with three mobile operators (Entel, Tigo and Viva) and one MVNO (Mio). All operators offer mobile broadband services through their UMTS/HSPA+ networks in the major urban centers of La Paz, Cochabamba and Santa Cruz. The market also has a LTE network (Entel) operating in the 700 MHz band which was a direct government allocation of 20 MHz to the state-owned operator during 2012.

ITU and Future Spectrum Plans:

The 180 MHz currently in use in Bolivia represents 21.4% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 13.85% of the ITU recommended amount of spectrum allocation for 2015. Bolivia's government announced its intention to auction additional spectrum for mobile services in the 700 MHz band during 2013. It is expected that this band will be used to provide mobile broadband services using LTE technology.

The Authority for the Regulation and Control of Telecommunications and Transport (ATT) announced that it plans to auction spectrum nationwide licenses during 2013 in the 1.5 GHz / 1.6 GHz, 1.7 / 2.1 GHz, 1.9 GHz and 700 MHz bands. In addition, ATT plans to auction regional spectrum licenses for the 900 MHz, 2.5 GHz, and 5.2 GHz bands. The regulator did not provide specific information on how much spectrum bandwidth would be auctioned for each band.

In June 2013, ATT published the call for an auction of 24 MHz of spectrum bandwidth in the 700 MHz band. If this spectrum is auctioned by 2015, the country would have allocated 14.4% of the ITU-RM 2078 recommendation for that year.

Bolivia does not impose a spectrum cap for mobile services.

BRAZIL

General:

Brazil has a population of 198,423,000 inhabitants. In 2012, the country reported a 132.79% mobile penetration rate in a market with five national mobile operators (Claro, Nextel, Oi, TIM and Vivo), two regional mobile operators (Algar and Sercomtel), and several companies licensed as MVNOs. As a part of their 2.5 GHz spectrum license requirements, the four largest national mobile operators (Claro, Oi, TIM and Vivo) offer LTE services in selected cities. As per a schedule established by the Brazilian regulatory authorities, coverage will gradually increase in order to cover most of the national population.

The three other operators offer mobile broadband services through their UMTS/HSPA networks. Most, if not all, of these operators will eventually migrate towards LTE networks to offer higher speed throughputs in their mobile broadband connections.

Mobile spectrum allocation in Brazil is divided into ten areas:

- Area I: São Paulo City
- Area II: State of São Paulo, excluding São Paulo City
- Area III: Rio de Janeiro and Santo Espirito states
- Area IV: Minas Gerais and Uberlandia states
- Area V: Parana and Santa Catarina states
- Area VI: Rio Grande do Sul state and Pelotas region
- Area VII: Center-West states
- Area VIII: Northern states
- Area IX: Bahia and Sergipe states
- Area X: Northeast states

Each region possesses a spectrum cap of 85 MHz, which is aggregated for the following bands: 850 MHz, 1.8 GHz, and 1.9 GHz / 2.1 GHz. In addition, the maximum amount of spectrum that an operator can have in the 2.5 GHz band fluctuates between 40 MHz and 60 MHz depending on the sub-band utilized. No spectrum cap was placed on 450 MHz.

ITU and Future Spectrum Plans:

The 503 MHz currently in use in Brazil represents 59.9% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 38.7% of the ITU recommended amount of spectrum allocation for 2015.

Brazil's government announced its intention to auction 90 MHz of spectrum bandwidth for mobile services in the 700 MHz band before 2015. The successful auction of this band would increase total allocated spectrum bandwidth to 611 MHz, which represents 46% of the ITU recommended amount for 2015.

CHILE

General:

Chile has a population of 17,402,630 inhabitants. In 2012, the country reported a 152.83% mobile penetration rate in a market with five mobile operators (Claro, Entel, Movistar, Nextel and VTR) and two MVNOs (Telsur-GTD and Virgin Mobile). All mobile operators offer mobile broadband services through UMTS / HSPA networks. LTE 2.5 GHz services began to be commercialized by Claro on June 28, 2013 and it's expected that by year-end 2013, at least three of the market's mobile operators will start offering LTE services.

ITU and Future Spectrum Plans:

The 395 MHz currently in use in Chile represents 47% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 30.4% of the ITU recommended amount of spectrum allocation for 2015. Chile's government announced its intention to auction additional 90 MHz spectrum for mobile services in the 700 MHz band during 2013.

A successful auction of the 700 MHz band would increase total allocated spectrum bandwidth to 485 MHz, which represent 37.3% of the ITU recommended amount for 2015. It is expected that this band will be used to provide mobile broadband services using LTE technology. The APT band channelization has already been approved.

For the award process of the AWS band, Chile approved a spectrum cap of 60 MHz for the sole combination of 850 MHz, 1.9 GHz and AWS mobile bands. This constraint does not apply for other bands such as 2.5 GHz band and 700 MHz bands, and other combinations.

COLOMBIA

General:

Colombia has a population of 47,969,618 inhabitants. In 2012, the country reported a 100.49% mobile penetration rate in a market with four mobile operators (Claro, Movistar, Tigo and UNE), an iDEN operator (Avantel) and six MVNOs (ETB, Exito, Metrotel, Telebucaramanga, Uff and Virgin Mobile). The number of mobile operators will increase over the next 12 to 18 months as a result of the June 2013 spectrum auction where three companies won licenses: Avantel (2 x 15 MHz license in the AWS band), ETB-Tigo Consortium (2 x 15 MHz license in the AWS band) and DirecTV (2 x 15 MHz license and 40 MHz TDD in the 2.5 GHz band). These companies are expected to enter the mobile market by 2014.

LTE services began commercialization in June 2012 by UNE. However, the five companies that won spectrum blocks amounting to 190 MHz of bandwidth in the June 2013 auction are required to launch LTE services during 2014.

ITU and Future Spectrum Plans:

The 412.5 MHz that was allocated to operators in Colombia represent 31.7% of the recommended amount stated by the ITU-RM 2078 for 2015.

Prior to the June 2013 spectrum auction, total bandwidth allocated in the market was 222.5 or 26.9% of the ITU recommended amount of spectrum bandwidth for 2010. Another impact of this auction was the increase of the spectrum cap from 85 MHz in all mobile frequencies to 115 MHz (30 MHz for bands under 1 GHz and 85 for bands above 1 GHz).

Colombian regulatory authorities intend to auction at least 125 MHz of additional spectrum bandwidth before the end of 2014. The spectrum bands to be auctioned are 700 MHz (90 MHz), 1.9 GHz (5 MHz) and 2.5 GHz (30 MHz). Once these bands are allocated, Colombia would have assigned 41.3% of the ITU recommended spectrum bandwidth for 2015.

COSTA RICA

General:

Costa Rica has a population of 4,789,000 inhabitants. In 2012, the country reported a 104.46% mobile penetration rate in a market with three mobile operators (Claro, ICE-Kolbi and Movistar) and two MVNOs (Tuyo Mobile and Full Mobile). All operators offer mobile broadband services through UMTS / HSPA networks. A free trial of LTE services was announced during 2013 by the state-owned operator, with commercial services expected before the end of the year.

ITU and Future Spectrum Plans:

The 260.6 MHz currently in use in Costa Rica represents 31% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 20% of the ITU recommended amount of spectrum allocation for 2015.

During April 2013, the Ministry of Telecommunications announced that it was conducting a study to find "the best suited portions of spectrum" so it can be auctioned. The findings of this study have yet to be made public.

On June 19, 2013, the state operator (ICE) launched LTE 2.5 GHz services for the commercialization of fixed wireless broadband services only. This spectrum band cannot be used for the provision of mobile services.

Costa Rica does not impose a spectrum cap for mobile services.

DOMINICAN REPUBLIC

General:

Dominican Republic has a population 10,164,000 inhabitants. In 2012, the country reported a 90.86% mobile penetration rate in a market with four mobile operators (Claro, Orange, Tricom and Viva). All mobile operators offer mobile broadband services through UMTS / HSPA+ and CDMA2000 1x EV-DO networks. In addition, two operators (Orange Dominicana and Tricom) offer commercial LTE mobile broadband services.

ITU and Future Spectrum Plans:

The 214.4 MHz currently in use in Dominican Republic represents 25.5% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 16.5% of the ITU recommended amount of spectrum allocation for 2015.

During 4Q11, the Dominican Institute of Telecommunications (INDOTEL) conducted a spectrum auction that was cancelled due to the opposition from existing broadcasters that were using the spectrum. INDOTEL expects to start a new spectrum auction process to allocate this spectrum (19 MHz in the 900 MHz band and 90 MHz in the 1.9 GHz / 2.1 GHz band) to operators with experience in the provision of mobile services.

The successful auction of these two spectrum blocks will increase the total amount of bandwidth in use to 313.4 MHz, which represents 24.1% of the ITU recommended allocation for 2015.

Dominican Republic does not impose a spectrum cap for mobile services.

ECUADOR

General:

Ecuador has a population of 14,883,000 inhabitants. In 2012, the country reported a 114.35% mobile penetration rate in a market with three mobile operators (Claro, CNT and Movistar). All mobile operators offer mobile broadband services through UMTS / HSPA+ networks. LTE services are expected to be commercialized before the end of 2013 by the state-owned operator CNT.

ITU and Future Spectrum Plans:

The 180 MHz currently in use in Ecuador represents 21.4% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 13.9% of the ITU recommended amount of spectrum allocation for 2015.

In December 2012 the government granted state operator CNT 70 MHz of spectrum bandwidth (30 MHz in 700 MHz + 40 MHz in the 1.7 GHz / 2.1 GHz bands) through a direct allocation in order to launch LTE services.

Ecuador has a spectrum cap of 65 MHz, but it does not apply to spectrum directly allocated by the government to the state owned operator.

EL SALVADOR

General:

El Salvador has a population of 6,288,000 inhabitants. In 2012, the country reported a 131.01% mobile penetration rate in a market with four mobile operators (Claro, Digicel, Movistar and Tigo) and an iDEN operator (RED Intelfon). Two operators have mentioned their intention to offer mobile broadband services via LTE, but as of 2Q13, no launch dates have been announced.

ITU and Future Spectrum Plans:

The 204 MHz currently in use in El Salvador represents 24.3% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 15.7% of the ITU recommended amount of spectrum allocation for 2015.

The local regulator, General Superintendence of Electricity and Telecommunications (SIGET), has not announced plans for the allocation of additional spectrums. Its two primary short term priorities are the implementation of number portability and the definition of the Digital TV standard for the country.

Although there is not a spectrum cap and there is enough available actionable spectrum in El Salvador, SIGET imposed the return of 20 MHz of spectrum as a condition for the approval of a merger between two local operators; which was not accepted by the parties involved.

GUATEMALA

General:

Guatemala has a population of 14,051,000 inhabitants. In 2012, the country reported a 107.65% mobile penetration rate in a market with three mobile operators (Claro, Movistar and Tigo) and an iDEN operator (RED Intelfon). All mobile operators offer broadband services through UMTS / HSPA networks. No announcements on the deployment and launch of LTE commercial services have been made on this market.

ITU and Future Spectrum Plans:

The 210.6 MHz currently in use in Guatemala represents 25% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 16.2% of the ITU recommended amount of spectrum allocation for 2015.

Although no plans for spectrum allocations have been announced for the near future, the Superintendence of Telecommunications (SIT) approved updating the National Table of Frequency Allocation through the enactment of resolution SIT-220-2013.

Guatemala does not impose a spectrum cap for mobile services.

HONDURAS

General:

Honduras has a population of 7,922,000 inhabitants. In 2012, the country reported a 91.47% mobile penetration rate in a market with three mobile operators (Claro, Hondutel and Tigo). Operators offer mobile broadband services through UMTS/HSPA/HSPA+ networks. No announcements on the deployment and launch of LTE commercial services have been made on this market.

ITU and Future Spectrum Plans:

The 170 MHz currently in use in Honduras represents 35.4% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 13% of the ITU recommended amount of spectrum allocation for 2015. Honduran regulatory authorities have made no announcements of their plans for future mobile spectrum allocation.

Honduras does not impose a spectrum cap for mobile services.

MEXICO

General:

México has a population 114,800,000 inhabitants. In 2012, the country reported an 87.54% mobile penetration rate in a market with four mobile operators (Iusacell/Unefon, Movistar, Nextel and Telcel) and two MVNOs (Maxcom and Megacable). All operators offer mobile broadband services through UMTS / HSPA+ networks. LTE services began commercialization in 2012 by two mobile operators (Movistar and Telcel) with another operator indicating that it was conducting trials to launch in the near future.

Mobile spectrum allocation in Mexico is divided into nine regions:

- Region I: Baja California, Baja California Sur and the municipality of San Luis Rio Colorado Sonora State
- Region II: Sonora and Sinaloa excluding the municipality of San Luis Rio Colorado in Sonora State
- Region III: Chihuahua, Durango, and Tamaulipas excluding the municipalities of Torreon, Francisco I. Also includes the municipalities of Madero, Matamoros, San Pedro and Viesca in Coahuila state
- Region IV: Coahuila, Nuevo Leon and Tamaulipas excluding the municipalities of Torreon, Francisco I in Tamaulipas state and Madero, Matamoros, San Pedro and Viesca in Coahuila State
- Region V: Jalisco, Nayarit, Colima and Michoacán, excluding the municipalities of Huejucar, Santa María de los Angeles, Colotlán, Teocaltiche, Huejuquilla, Mesquitic, Villa Guerrero, Bolaños, Lagos de Moreno, Villa Hidalgo and Encarnacion Diaz Ojuelos in the state of Jalisco
- Region VI: Aguascalientes, San Luis Potosí, Zacatecas, Guanajuato, Querétaro, and the municipalities of Huejucar, Santa María de los Angeles, Colotlán, Teocaltiche, Huejuquilla, Mesquitic, Villa Guerrero, Bolaños, Lagos de Moreno, Villa Hidalgo and Encarnacion Diaz Ojuelos in the state of Jalisco
- Region VII: Puebla, Tlaxcala, Veracruz, Oaxaca and Guerrero
- Region VIII: Chiapas, Tabasco, , Campeche and Quintana Roo
- Region IX: Federal District and the states of Mexico, Morelos and Hidalgo

ITU and Future Spectrum Plans:

The 243 MHz currently in use in Mexico represents 28.9% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 18.7% of the ITU recommended amount of spectrum allocation for 2015.

Discussion about the allocation of additional spectrum in the 700 MHz and 2.5 GHz spectrum bands has been frequent in the market during the past years. In early June 2013, the final approval of a telecommunications reform in early June 2013 clarified the status of 90 MHz of bandwidth within the 700 MHz they have reserved for the creation of a LTE wholesale network via a Private Public Partnership. It's expected that this auction would occur before the end of 2014. Once this takes place, Mexico the total amount of spectrum allocated in the market would represent 25.6% of the ITU recommendation for 2015.

The government is trying to recover 190 MHz of spectrum bandwidth in the 2.5 GHz originally allocated for the provision of MMDS services. No date has been determined for the conclusion of this process.

Mexico has a spectrum cap of 80 MHz for mobile services and 70 MHz for 800 and 1900 band.

NICARAGUA

General:

Nicaragua has a population of 5,979,000 inhabitants. In 2012, the country reported an 83.45% mobile penetration rate in a market with two commercial mobile operators (Claro and Movistar). Both operators offer mobile broadband services via UMTS / HSPA+. A third mobile operator was licensed during 1Q13 and should launch commercial services by the end of year. One operator announced its commitment to the deployment of LTE, but no launch dates have been announced.

ITU and Future Spectrum Plans:

The 262 MHz currently in use in Nicaragua represents 31.2% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 20.2% of the ITU recommended amount of spectrum allocation for 2015. This amount includes 72 MHz of spectrum bandwidth allocated in two blocks of 36 MHz in the 700 band. Contrary to many Latin American countries, Nicaragua chose the US channelization for this band.

Nicaraguan regulatory authorities have made no further announcements of upcoming spectrum allocation. It is expected that the government should start considering new licensing processes after the launch into orbit of Nicaragua's first satellite, NicaSat 1, in 2016.

Nicaragua does not impose a spectrum cap for mobile services.

PANAMA

General:

Panama has a population of 3,582,000 inhabitants. At year-end 2012, the country reported a 146.76% mobile penetration in a market with four mobile operators (Cable & Wireless, Claro, Digicel and Movistar). All operators offer mobile broadband services through UMTS / HSPA networks and have announced their commitment to launch LTE on this market.

ITU and Future Spectrum Plans:

The 130 MHz currently in use in Panama represents 15.5% of the recommended amount stated by the ITU-RM 2078 for 2010 and only 10% of the ITU recommended amount of spectrum allocation for 2015.

Although no official date has been announced for the licensing of more spectrum bandwidth, the National Authority of Public Services (ASEP) announced that is considering auctioning 108 MHz of bandwidth in the 700 MHz band. The successful auctioning of this spectrum would increase Panama's spectrum allocation to 18.3% of the ITU recommendation for 2015.

Panama does not impose a spectrum cap for mobile services.

PARAGUAY

General:

Paraguay has a population of 6,675,000 inhabitants. In 2012, the country reported a 110.07% mobile penetration rate in a market with four mobile operators (Claro, Personal, Tigo and Vox). All operators offer mobile broadband services through UMTS / HSPA networks. LTE services began commercialization in 2013 by two mobile operators and it is expected that before the end of 2014, all operators will be offering mobile broadband services using this technology.

ITU and Future Spectrum Plans:

The 220 MHz currently in use in Paraguay represents 26.2% of the recommended amount stated by the ITU-RM 2078 for 2010 and only 16.9% of the ITU recommended amount of spectrum allocation for 2015.

The regulatory authorities announced their intention to auction spectrum in the 1.7 GHz / 2.1 GHz bands before the end of 2014. The objective is to allocate four 20 MHz spectrum licenses in the 1710 MHz to 1770 MHz and 2110 MHz to 2170 MHz bands:

- C Band: 1730 MHz to 1740 MHz + 2130 MHz to 2140 MHz
- D Band: 1740 MHz to 1750 + 2140 MHz to 2150 MHz
- E Band: 1750 MHz to 1760 + 2150 MHz to 2160 MHz
- F Band: 1760 MHz to 1770 MHz + 2160 MHz to 2170 MHz

The auction of additional 80 MHz of spectrum bandwidth will represent 23% of the ITU spectrum allocation recommendation for 2015.

Paraguay does not impose a spectrum cap for mobile services.

PERU

General:

Peru has a population of 29,948,000 inhabitants. In 2012, the country reported a 99.3% mobile penetration rate in a market with four mobile operators (Claro, Movistar, Nextel and Viettel). Three of these mobile operators offer mobile broadband services through UMTS / HSPA networks, while the fourth operator is scheduled to begin commercial services in August 2013.

ITU and Future Spectrum Plans:

The 304 MHz currently in use in Peru represents 36.2% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 23.4% of the ITU recommended amount of spectrum allocation for 2015.

On July 22, 2013 Peru's government auctioned AWS spectrum; 2 swaths of 20+20 MHz each were awarded to Telefonica and Americatel.

Peru's government announced its intention to auction additional spectrum for mobile services in the 700 MHz and 2.3 GHz bands before 2015. It is expected that this band will be used to provide mobile broadband services using LTE technology.

Peru has a spectrum cap of 100 MHz for mobile services; 60 MHz for the bands of 800, 900 & 1900 MHz and 40 MHz for the AWS (1.7/2.1 GHz band).

PUERTO RICO

General:

Puerto Rico has a population of 3,743,000 inhabitants. In 2012, the country reported an 80.9% mobile penetration rate in a market with five mobile operators (AT&T, Claro, Open Mobile, Sprint Nextel and T-Mobile), an iDEN operator (Proxcel Wireless) and several MVNOs. All operators offer mobile broadband services through UMTS / HSPA networks. These mobile operators also offer 3G mobile broadband services via UMTS / HSPA+ or CDMA 1x EV-DO, with four already offering LTE services. The single remaining mobile operator is expected to launch LTE commercial services before the end of 2013.

ITU and Future Spectrum Plans:

The 336.75 MHz currently in use in Puerto Rico represents 40% of the recommended amount stated by the ITU-RM 2078 for 2010 and only 25.9% of the ITU recommended amount of spectrum allocation for 2015.

Puerto Rico does not impose a spectrum cap for mobile services.

URUGUAY

General:

Uruguay has a population of 3,395,000 inhabitants. In 2012, the country reported a 152.26% mobile penetration rate in a market with three mobile operators (Antel, Claro and Movistar). All operators offer mobile broadband services through UMTS / HSPA+ networks. LTE services began commercialization during 2012 by one operator (Antel).

ITU and Future Spectrum Plans:

The 270 MHz currently in use in Uruguay represented 32.4% of the recommended amount stated by the ITU-RM 2078 for 2010, and only 20.8% of the ITU recommended amount of spectrum allocation for 2015.

The last spectrum auction took place in March 2013. 130 MHz of additional bandwidth was granted to the market's mobile operators and increased the total amount of assigned spectrum to 270 MHz.

Uruguay's government announced its interest in auctioning additional spectrum for mobile services in the 700 MHz band, but no further details have been received from the regulator. It is expected that this band will be used to provide mobile broadband services using LTE technology.

Uruguay does not impose a spectrum cap for mobile services.

VENEZUELA

General:

Venezuela has a population of 29,953,000 inhabitants. In 2012, the country reported a 110.29% mobile penetration rate in a market with three mobile operators (Digitel, Movistar and Movilnet). All operators offer mobile broadband services through UMTS / HSPA networks, although CDMA 2000 1x EV-DO still have some presence (30% share) in the market.

ITU and Future Spectrum Plans:

The 204 MHz currently in use in Venezuela represents 42.5% of the recommended amount stated by the ITU-RM 2078 for 2010 and only 15.7% of the ITU recommended amount of spectrum allocation for 2015.

The last allocation of spectrum (30 MHz in 1.8 GHz and 40 MHz in 1.9 GHz) took place in September 2012. As of now, no further announcements have been made by the regulatory authorities regarding the allocation of more spectrum bandwidth in the near future.

Venezuela does not impose a spectrum cap for mobile services.