

# Broadband Leadership in Emerging Markets

Kas KALBA (\*)  
New Haven, CT, USA

**Abstract:** Extensive broadband use has largely occurred to date in developed economies. However, there are a growing number of emerging markets, including Bulgaria, China, Malaysia, Mexico, Romania and South Africa as well as a number of Caribbean island nations, where mobile or fixed broadband or both have achieved moderately high penetration levels. The paper addresses the prospects of broadband development in emerging markets, defined as countries with GDP per capita between \$2500 and \$10,000. In the process it focuses on the following issues: (1) what factors best explain the leadership position of emerging markets with the highest fixed and mobile broadband penetration levels; and (2) how do we better understand the relationships between supply- and demand-side drivers of broadband adoption and use in emerging markets? The paper finds that emerging markets with broadband leadership positions do not reflect the highest GDP per capita levels (within the \$2500 - \$10,000 range), which suggests that income plays less of a role in its adoption than is the case with mobile phones. At the same time, other factors appear to play an important role in determining why some emerging countries have been able to achieve high rates of broadband adoption and use. These factors include demand - side endowments (education, household size), geography (size of territory, population density, proximity to earlier - stage broadband leaders), housing stock, legacy infrastructure, income distribution, the presence - or absence - of cable TV operators, and regulatory and licensing policies. The paper also identifies three different models of broadband development - namely, dual-mode leadership (fixed and mobile), single-mode mobile leadership, and single-mode fixed leadership. To date these models have generally been associated with different subsets of the above - mentioned factors and have largely prevailed in different regions of the world. The main examples of the dual-mode model stem from Eastern Europe and parts of Latin America, the mobile-only or mobile-dominated model is common to the African and Asian leaders, and the fixed-only model is represented by several Caribbean nations.

**Key words:** broadband, innovation adoption, emerging markets.

---

(\*) The author is grateful to Brian Carvalho for his research support in preparing this paper. He also wishes to acknowledge the useful comments of Bob Bell, Pieter Groot, Andy Haire, John LeGates, Ainsley Lloyd, Claire Milne, Hector Salgado and Rohan Samarajiva, who reviewed earlier versions of the paper.

**B**roadband access and use is increasingly widespread in the developed world. It is available on a spot basis in a growing number of emerging markets and has started to appear in low-income "frontier markets" such as Bolivia, Senegal and Sri Lanka. This paper takes a look at how broadband has developed to date in middle-income emerging markets, focusing on the countries in this group that have achieved relatively high levels of broadband adoption.

The paper has three principal purposes:

- To explain why certain countries have been broadband leaders to date;
- To identify the factors that drive broadband development in emerging markets; and
- To examine the degree to which fixed and mobile broadband represent complementary or alternative forms of broadband development in the context of emerging markets.

It will also examine the extent to which particular countries may provide models of broadband development for other emerging countries and for "frontier markets," which start from a lower economic base.

The paper builds on a framework, previously applied to the adoption of mobile phones, that takes a broad range of factors into account in examining the drivers of innovation adoption - from demographic and climate differences to legacy infrastructure and how services are billed (e.g. on a prepaid basis) (KALBA, 2008). In addition to demand - and supply - side factors, the framework examines how geography, regulation and industry circumstances can help explain why a particular communications technology has been adopted faster in some markets than others.

At the same time, the paper is cautious in assuming that the same factors that have been associated with mobile phone adoption, including the presence of legacy fixed networks and the relevance of GDP per capita, will be associated with broadband adoption, as fixed broadband is generally adopted at the household rather than individual level and as educational attainment, industrial strategy and other factors have been found to be associated with broadband use.<sup>1</sup> Other factors that the paper addresses include the roles of household size, population density, and income equality

---

<sup>1</sup> With respect to the role of education, see note 5 *infra*.

in fostering broadband development. However, like other early stage research, this paper does not contend that all relevant factors in explaining broadband adoption have been taken into consideration. Some potential factors could not be examined directly due to a lack of data (e.g. levels of investment in broadband by operators and the governments, availability of consumer credit) although indirect indicators were available in some cases.<sup>2</sup> Similarly, some of the assumptions made were based on "qualitative" inputs, such as the amount and range of content and applications that broadband users can - or do - access in a given country or language issues in using available content.

The paper begins by reviewing those emerging countries - and clusters thereof - that have achieved the highest levels of broadband adoption (or penetration in the language of market research) to date.

## ■ Who are the broadband leaders?

Are the leading emerging broadband markets teeming with young people? Are they markets with the highest economic growth? Are they countries that were early adopters of national broadband strategies - or places with the poorest fixed networks? Generally, as tables 1 and 2 below reflect, the answer is no. Most of today's broadband leaders do not match these preconceptions. Bracketing emerging economies as those with GDP per capita less than \$10,000 and more than \$2500, table 1 presents the countries with the highest fixed broadband penetration within this income range, based on data from the International Telecommunications Union (ITU).<sup>3</sup> The table also provides population density, income distribution and Internet downloading speed benchmarks. Table 2 will present the countries in this group with the highest mobile broadband penetration. (In all, there were 61 countries that fell into this income range in 2010, according to the World Bank.<sup>4</sup>)

---

<sup>2</sup> For example, download speeds (see table 1 below) can be taken as rough indicators of broadband investment levels, assuming similar population densities and other parities.

<sup>3</sup> The ITU defines broadband as a network offering combined speed, equal to or greater than, 256 kbit/s in one or both directions.

<sup>4</sup> The World Bank, GDP per capita (current US\$), 2010; available at <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>. When 2010 data was missing, countries were included if their earlier GDP per capita fell within the defined range.

## Fixed broadband leaders

The list of leading fixed broadband countries in table 1 below is instructive in that it does not include certain countries that might be expected to be on such a list. None of the BRICs, for example, appear in the table. Brazil and Russia had fixed broadband penetration levels of 6.8 and 11.0 in 2010 but their incomes per capita exceeded \$10,000 and, consequently, they do not appear in the table. India's GDP per capita level was below \$1500 and its fixed broadband penetration was below 1%. China's GDP per capita is in the middle of the range covered in the table, but it falls just below the top ten level in penetration terms, notwithstanding its more than 125 million fixed broadband subscribers.

While the penetration levels in table 1 are based on the ITU's low-level definition of broadband (256 kbps), as the data in the last column indicates, the lead countries average much higher speeds - one or two orders of magnitude higher.

**Table 1 - Emerging markets with highest fixed broadband penetration, 2010**

Country	Fixed BB/ 100 cap	GDP/cap (USD)	Pop./sq. mi.	Gini Index	Download Speed (mbps)**
1. Bulgaria	14.52	6,333	26.22	28.2 (2007)	23.18
2. Romania	13.87	7,539	35.34	30.0 (2009)	25.25
3. Dominica	13.86	6,859	34.58	n.a.	2.72
4. Grenada	13.82	7,435	116.28	n.a.	14.81
5. Belarus	13.0 (*)	5,765	17.86	27.2 (2008)	4.32
6. St. Lucia	11.58	6,884	108.3	40.3 (2007)	2.05
7. St. Vincent & Grenadines	11.43	6,466	106.2	n.a.	2.88
8. Serbia	11.18	5,270	31.54	27.8 (2009)	5.03
9. Mexico	9.98	9,133	22.04	48.3 (2008)	n.a.
10. Argentina	9.56	9,124	5.7	44.5 (2010)	3.71

(\*) BuddeComm

(\*\*) Netindex, average during October 29, 2009 - April 29, 2012 <sup>5</sup>

*Source: Kalba International, Inc., based on ITU and World Bank data (2010), unless otherwise noted*

Most of the *emerging* fixed broadband leaders listed in table 1 are relatively small countries. The clear exceptions are Argentina and Mexico,

<sup>5</sup> Available at <http://www.netindex.com/download/allcountries/>

which have significant geographical presence, though the population of Argentina is concentrated in the northern portion of the country. However, several of the leaders are small island countries with very high population densities, including Grenada and St. Lucia. The list implies that a relatively small country can deploy broadband more rapidly than a large one can, although China's near-list position should not be overlooked.

We notice also that income does not automatically assure a place on the list. Relatively wealthy emerging economies like Botswana, Costa Rica, Gabon, Lebanon and South Africa do not appear on the list while less affluent ones, measured on a GDP per capita basis, like Belarus, Serbia and Bulgaria do. Possibly distribution of income is a more important factor, as the former countries reflect relatively high inequality whereas the latter ones are relatively egalitarian, as reflected in their Gini coefficients. <sup>6</sup>

Similarly, the benefits of compact geography and urbanization do not necessarily translate into higher broadband quality - or transmission speed. Bulgaria, Romania and Grenada have quite high average download speeds (column six) but the other countries do not excel on this dimension. Turning to another source, we find that Romania and Bulgaria appear in a list of the top 66 countries on the basis of their broadband transmission speeds and latency rates (31<sup>st</sup> and 34<sup>th</sup> rankings, respectively); the only other countries in table 1 that achieved this type of standing in 2009 were Mexico and Argentina (46<sup>th</sup> and 47<sup>th</sup> place). <sup>7</sup>

There may also be some regional effects. The list on table 1 is made up of two clusters of countries - an East European cluster (Belarus, Bulgaria, Romania, Serbia) and a Caribbean cluster (Dominica, Granada, St. Lucia, St. Vincent and the Grenadines). <sup>8</sup> This may reflect the influence of neighboring countries on each other in fostering broadband development and/or of the nearby developed countries, namely West European and North American ones, respectively.

---

<sup>6</sup> For example, Costa Rica's Gini coefficient is 50.7 (2009, latest year) and South Africa's is 63.1 (2009).

<sup>7</sup> See "Global Broadband Quality Study Shows Progress, Highlights Broadband Quality Gap," Said Business School and Universidad de Oviedo, October 1, 2009.

<sup>8</sup> Arguably, Mexico and Argentina form a regional cluster as well but not in the sense of physical proximity and influence that the two regions above appear to reflect.

## Mobile broadband leaders

Table 2 shows the leading mobile broadband countries among emerging economies based on 3G subscriber statistics.<sup>9</sup> These penetration levels do not measure mobile broadband use but merely potential use as not all 3G subscribers activate and use data features and applications. Nonetheless, barring significant differences among the leading countries in such activation levels, the mobile broadband subscriber levels provide a useful comparative index.

**Table 2 - Emerging markets with highest mobile broadband penetration, 2009**

Country	Mobile BB/100 cap	GDP/cap (USD <sup>(*)</sup> )	Pop./sq. mi.	Gini Index
1. Belarus	27.29	5,765	17.86	27.2 (2008)
2. Malaysia	26.75	8,373	32.68	46.2 (2009)
3. Romania	26.32	7,539	35.34	30.0 (2009)
4. Montenegro	14.74	6,505	17.86	30.0 (2008)
5. Bulgaria	12.79*	6,333	26.22	28.2 (2007)
6. South Africa	10.52	7,280	15.58	63.1 (2009)
7. Serbia	8.76	5,270	31.54	27.8 (2009)
8. Mauritius	8.02	7,591	239.78	39.0 (2006) (**)
9. Argentina	5.78	9,124	5.1	44.5 (2010)
10. Mexico	5.06	9,133	22.04	48.3 (2008)

(\*) 2010 data

(\*\*) CIA World Fact Book estimate

*Source: Kalba International, Inc., based on ITU and World Bank data (2009), unless otherwise noted*

In reviewing table 1, it is noteworthy that most of the mobile leaders are also fixed leaders. Essentially both the East European cluster and the Latin American countries on the fixed broadband list re-appear among the mobile broadband leaders. This calls into question the concept that mobile broadband thrives where there is the least amount of fixed infrastructure and service availability.<sup>10</sup> However, it also raises the question of whether

<sup>9</sup> The ITU defines 3G services as providing a minimum speed of 2 mbps when subscribers are stationary or walking slowly and 384 kbps when moving at higher speeds.

<sup>10</sup> At a minimum it suggests that there are two paths to mobile broadband growth, one that is linked, at least indirectly, to fixed telephone penetration, and the other that is independent of significant fixed-line availability and use. In this context, an often-heard theory is that African countries represent the second pattern, yet South Africa has one of the highest fixed penetration levels in Sub Saharan Africa. More generally, mobile and fixed penetration rates

increasing mobile broadband adoption and use will over time dampen demand for fixed broadband in these countries on substitutability or affordability grounds or whether to the contrary it will increase the demand for higher-rate, higher-stability fixed broadband access.

At the same time, there is the countervailing example of South Africa that demonstrates the possibility of high mobile broadband penetration where very limited fixed broadband exists - though not limited fixed telephone penetration.<sup>11</sup> (The other new names on the mobile broadband list - Malaysia, Montenegro and Mauritius - all had significant fixed broadband penetration in 2010, albeit somewhat less than the top ten emerging markets that are listed in table 1). In a different way, the Caribbean countries on table 1 also reflect that fixed and mobile broadband do not always develop hand in hand, as they have high fixed broadband connectivity but non-existing or low mobile broadband penetration and so do not appear in table 2.

In short, there may be "converging" factors or strategies that drive fixed and mobile broadband adoption in some countries while single-mode broadband adoption prevails in other countries.<sup>12</sup> Is it that some countries purposefully focus on one mode of broadband delivery and accessibility - or that other factors differentiate markets that excel in the take - up of fixed broadband and mobile broadband, respectively? By the same token, how do some countries manage to achieve broadband leadership positions in both the fixed and mobile contexts?

Before addressing these questions, it is useful to note that, as with fixed broadband, the mobile broadband leaders do not all - or even mostly - fall into the highest income segment of countries with GDP per capita between \$2500 and \$10,000. All but three have GDP per capita of less than \$7600. At the same time, a reverse relationship with income should not be assumed, as all the countries on the list have GDP per capita in excess of \$5200. This suggests that income plays a role but not as determinative as with respect to mobile phone adoption - or that broadband is not as much of

---

have been highly correlated across African countries, at least during the initial phases of mobile market development; see *The Global Adoption and Diffusion of Mobile Phones*, *op. cit.*, p. 29.

<sup>11</sup> See note 6 *supra*.

<sup>12</sup> Mono-modal in this context is not meant to imply a single type of infrastructure as countries with high levels of fixed broadband may rely on multiple distribution technologies (DSL, cable TV, wireless, etc.) as may countries with predominantly mobile broadband connectivity.

a necessity in emerging markets (for content, digital literacy, or other reasons) as mobile phones are.<sup>13</sup>

As for income distribution, the countries on the list with relative equality of income are also the ones with older populations - namely, the Eastern European cluster, all of which have median ages between 35 and 42; conversely, the countries with more vertical income structures generally have younger populations (median ages 25 to 32). Does this mean that mobile broadband laggards are likely to have either unequal incomes and older populations or equal income distributions and younger ones? Not necessarily, as there are few examples of either of these two "sets" of countries. In fact, the conclusion that can be drawn here is that the Eastern European cluster is more robust than the others, in that a large percentage of the countries in the East European group appear on the leader list and many of the remaining entities in this group also have relatively high broadband penetration levels.

As for countries with vertical income structures and largely young populations, there are many more of these among emerging markets than there are the countries with ageing populations in relatively egalitarian societies. And, in fact, these types of markets mostly exhibit low levels of broadband penetration.

With respect to country size, the mobile broadband leaders have somewhat larger territories on average than the fixed broadband leadership group.<sup>14</sup> This is not surprising given that mobile infrastructure is usually easier to deploy than is fixed infrastructure.

Finally, we note that the range of penetration levels among the mobile broadband leaders is much wider (from 5.1 to 27.3%) than the respective range for the fixed broadband leaders (9.6 to 14.5%). This may reflect that there is a "take-off" point when mobile broadband subscriptions start to accelerate rapidly in middle - income economies. What remains unclear is whether this is a function of the high rate of mobile phone penetration, of the visibility of - and therefore imitation - generated demand for - broadband

---

<sup>13</sup> See pp. 21-25 in *The Global Adoption and Diffusion of Mobile Phones, op. cit.*, for a discussion of the varying effects of income on mobile phone adoption.

<sup>14</sup> This becomes evident when one compares the countries that appear on only one of the lists - namely, the four countries with high fixed broadband levels (all small Caribbean island nations) with the four newcomers to the mobile broadband leadership list, namely Malaysia, Montenegro, South Africa and Mauritius.



---

mobile use compared to fixed broadband use, or of marketing factors (price reductions, use of outdoor advertising, larger number of retail outlets, etc.) that favor mobile over fixed broadband takeoff.

## ■ What are the leadership models?

Here we will examine the broadband adoption leaders in more detail to see if they represent models that other emerging countries could readily emulate. Specifically, we will examine the main clusters of countries identified above as well as the other mobile broadband leaders, including the Latin American cases and Malaysia. Before doing so, we begin with a review of Korea, which was the original "emerging market" broadband leader and which provides a number of useful - and cautionary - lessons with respect to drawing models of broadband development from the experience of individual countries.

### The "Korean miracle" case

South Korea's GDP per capita was below the \$10,000 level in 1998 in the aftermath of the Asian Financial Crisis. It was at about this time that the government intensified its efforts to rapidly expand and improve broadband connectivity, partly as a way to stimulate consumer spending. Within two years more than 30% of Korean households were connected to broadband service over DSL and cable TV networks. Within five years Korea emerged as not only a broadband leader in its economic class but as a world leader, soon surpassing Canada, Japan, Sweden and the United States in the proportion of its households that were "connected" at speeds of 20 Mbps or more.<sup>15</sup>

Most explanations of the Korean broadband miracle focus on supply-side factors and associated government contributions, including various broadband investment initiatives, the country's high population density, the prevalence of large apartment blocks (further reducing deployment costs,

---

<sup>15</sup> South Korea continues to lead the world on a number of Internet connectivity metrics, including average connection speed, average peak connection speed and high broadband connectivity; the top six global cities with respect to average Internet connection speed are all found in South Korea; see Akamai, *State of the Internet*, 4<sup>th</sup> Quarter 2011 Report, Vol. 4, no. 4.

with the added help of subsidies for installing fiber cables to apartment buildings), the role of an industrial strategy aimed at boosting Korea's electronics exports, the fostering of competition between the incumbent telephone operator and the cable TV companies, and so on (OVUM Consulting, 2009; KIM, KELLY & RAJA, 2010). Demand stimulating initiatives, such as the "Ten Million Internet Education" program, are also cited in these studies (OVUM Consulting, 2009; KIM, KELLY & RAJA, 2010).

However, the demand-side endowments of Korea, including a highly - educated young population, its credit and consumption stimulation policies during the broadband surge, a horizontal income distribution, and the role of online games and other content-related drivers, are often ignored or minimized when Korea's broadband success is being explained. Given that Korea's income level per capita was less than a third of Japan's in 2000, this focus on supply-side factors and government initiatives is understandable but it also misses an important part of the broadband growth equation.<sup>16</sup>

What most analysts of the Korean case have missed are the demand-side endowments and pull-factors such as education that were at play. First, on a household basis, which is how fixed broadband service is generally paid for and used, the Korean market was not as disadvantaged as a simplistic GDP per capita comparison would suggest. Korean households, though rapidly declining in size in previous decades, were still 20% to 50% larger than their counterparts in Canada, Sweden and the U.S.; in other words, the household income differential was much smaller than the per capita one.<sup>17</sup> Second, Korean households had more young members and these were likely to be more educated than their western counterparts.<sup>18</sup> And a greater share of Korean households were within close proximity to the median household income level than was the case in Canada and especially in the United States, where the levels of income inequality are higher.

---

<sup>16</sup> See <http://earthtrends.wri.org/text/economics-business/variable-638.html> for historical GDP per capita figures in current dollars.

<sup>17</sup> The average family size in Canada, Sweden and the United States in 2000 were 2.53, 2.01 and 2.56 respectively; see [www.csls.ca/reports/csls2011-12AppendixTables.pdf](http://www.csls.ca/reports/csls2011-12AppendixTables.pdf). The Korean number was 3.1 according to PARK *et al.* (2002).

<sup>18</sup> For example, by 1998 young adult Koreans had higher upper secondary education attainment rates (above 90%) than their counterparts in Canada, Sweden and the U.S. The rates were about the same as those of young Japanese adults; however, the proportion of young adults in the Japanese population (and in Japanese households) was significantly lower. See Chart A10.2 in *Society at a Glance - OECD Social Indicators*, 2002.

Measured on the basis of aggregate years of advanced schooling per household - Korean households on average exceeded the educational endowments of households in North American, European and Japanese households.<sup>19</sup> Yet, as noted earlier, education levels are more closely related to broadband adoption than is income.<sup>20</sup> And income should be measured on a household basis rather than as GDP per capita with respect to fixed broadband adoption (though not usually with respect to mobile broadband, unless there is significant household sharing of the connection). By this measure Korean households were much closer in buying power to their western and Japanese counterparts.<sup>21</sup> Moreover, the broadband market in Korea was driven by strong demand for broadband-enhanced games, ecommerce, adult programming, and online college-test preparation services. Finally, consumer financing was made widely available in the post Asian financial crisis period, which undoubtedly had an impact (direct and indirect) on the growth of broadband service subscriptions and purchase of broadband-related home electronics.

Conversely, on the supply side, Korea launched so many separate initiatives - from backbone subsidies, tax credits for the wiring of buildings and network unbundling to applications development ("KII Testbed") and a PC buying program for low-income residents, among others - that it has been difficult to separate the respective benefits of particular intervention programs or to weigh and compare their cost effectiveness. Overall, the Korean case, often characterized as an airtight example of the dominance of supply-side and government-intervention factors in achieving high broadband adoption, with individual analysts often stressing particular stimulus initiatives, in fact underscores the complexities that are involved in understanding what drives broadband development.

### **The Eastern European cluster**

So what is it about East European countries and their populations that takes so readily to broadband? We see the tops of both the fixed and

---

<sup>19</sup> The author presented an early analysis of the role of demand-side endowments in Korean broadband development in "Korea, Japan, and the U.S. Broadband Gap," Draft, August 2006.

<sup>20</sup> See note 5 supra.

<sup>21</sup> On a median equalised disposable household income basis they had caught up with Japanese households and were ahead of Italian, Spanish and Israeli households by 2007, though still significantly behind households in Canada, Sweden and the U.S. See Chart GE1.1, Society at a Glance - OECD Social Indicators, 2011.

mobile broadband lists dominated by East European markets - especially those of Bulgaria, Belarus and Romania. Moreover middle-income countries such as Macedonia, Serbia, Montenegro, Bosnia and Herzegovina, Moldova and Ukraine have fixed broadband penetration levels of 12.5 to 6.5%.<sup>22</sup>

There are several factors that may account for the leadership of East European markets in adopting broadband services. These markets benefit from:

- relative geographical compactness and high levels of urbanization;<sup>23</sup>
- relatively high levels of education and literacy, including technical education as well as understanding of major web-present languages such as English, Russian and German;
- high-density housing stock on the periphery of cities and even in villages in some cases, a legacy of the Soviet period;
- the historical technical orientation of some of the enterprises and individuals of this region. For example, Bulgaria was a top exporter of telecommunications equipment (small exchanges, etc.) within the Comecon group before the breakup of the Soviet Block;
- prevalence of small households, typically with two or more breadwinners (some holding more than one job), resulting in greater disposable income than in larger households with multiple unemployed members;<sup>24</sup>
- relatively large fixed telephone networks, which has allowed relatively widespread DSL deployment in urban areas;
- liberalized telecommunications regulatory frameworks, which have been in place in some countries for 10 or more years (e.g. Romania, Bulgaria) and have fostered competition (e.g. cable TV-based operators, multiple 3G mobile operators);
- relatively low levels of income inequality,<sup>25</sup> which has in some cases delayed the early adoption of ICT innovations (while prices are high) but has fostered relatively quick and widespread adoption once prices drop.

---

<sup>22</sup> ITU data.

<sup>23</sup> For an analysis and discussion of broadband penetration and urbanization levels, see *Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world* (Berkman Center for Internet and Society, Harvard University, October 2009), pp. 35-36.

<sup>24</sup> Conversely, small households generally involve less sharing of access to broadband connections, which occurs in larger households (where the latter can afford such connections).

<sup>25</sup> The levels of inequality in Eastern Europe have, however, been rising in recent years, even as they lag those of other regions.

On this last point it is noteworthy that Latin American markets exhibited faster mobile growth in the 1990s than did East European markets. Yet penetration rates in Latin America matured relatively quickly (e.g. once reaching 40 or 50%) whereas those in Eastern Europe continued to grow, reflecting the more horizontal income distribution as well as the aggressive adoption of multi-SIM usage in the mobile sphere. Another factor affecting the East Europe's broadband profile is proximity to Western Europe where broadband adoption has generally flourished - and its attraction of investment from outside (largely Western European) telecommunications operators, such as T-Mobile, Telekom Austria, TeliaSonera, and Vodafone.<sup>26</sup> However, this investment influx is much more evident in the mobile sector than on the fixed side, where a number of incumbent operators have failed to attract transforming strategic investors for extended periods, for example in Moldova, Serbia and Ukraine.

One question remains. Why does Belarus rank so high on both lists, given its non-liberal market character and government? The answer may have to do with how much time the largely urban population spend indoors for climate and other reasons (limited retail sector, etc.).<sup>27</sup> In addition, the government has encouraged joint ventures between state-owned operators and foreign investors in the telecommunications sector and has fostered considerable competition in the mobile sector. Like China and in some respects Japan and Korea, Belarus is pursuing a top-down form of competitive service delivery, which appears to be producing results in broadband adoption.

### **The Caribbean island cluster**

The relatively small size of many Caribbean island countries has already been cited as a factor facilitating broadband deployment. Compactness may also contribute to adoption by fostering exposure to broadband and its use by friends, neighbors and fellow citizens. By the same token the use of fixed broadband is less visible to others compared to mobile phones, the presence of which is hard to miss in the Caribbean as in most places in the world.

---

<sup>26</sup> See, for example, table 3 in WHALLEY & CURWEN, 2012.

<sup>27</sup> Lonely Planet indicates that "Average January temperatures are between -4°C and -8°C, with frosts experienced for five to six months of the year."  
<http://www.lonelyplanet.com/belarus/weather#ixzz1tYKOF3AP>

So what is driving fixed broadband in countries such as Dominica, Grenada and St. Lucia, which rank at or near the top of the emerging markets pyramid of broadband use? Competition is the most notable factor, as both an incumbent telecom operator (Cable & Wireless) and a private cable TV company offer broadband services. In the case of Grenada, the cable operator (operating as Flow) offers a Triple Play service ("watch.talk.click") that includes Internet access at speeds up to 12 mbps for about \$65 per month, less than half the price charged four years earlier when the transmission rate was almost an order of magnitude lower (FLOW, 2011). In other words, competition is working.

At the same time, the \$65 monthly price represents more than 3% of the pre-tax income of an average household of four persons. Moreover, there is a limited number of such "average" households in a population that includes smaller households of retired or semi-retired expats, larger ones with more children and fewer cash-deriving workers, and a growing number of single-person households. Until the price drops by another 50% or more, broadband subscriber growth rates are likely to remain lower in the Caribbean markets than in their East European counterparts, as is evident in recent years.

On the mobile side competition has also been a very significant factor in the region. With prepaid service available in small denominations, income has been much less of a "hurdle" in this communications service market. Yet mobile broadband service has only recently appeared, if at all, on many of the islands, including those of the east Caribbean to which the four fixed broadband leaders belong. In the case of the four Caribbean island nations that are ranked in table 1, 3G mobile service is supplied by only one operator or not at all.<sup>28</sup> By contrast, in Eastern Europe Belarus, Bosnia, Bulgaria, Macedonia, Moldova, and Romania all have two or more (usually three) 3G operators.<sup>29</sup>

This raises the question of what accounts for the limited presence to date of 3G service on many Caribbean islands? This should be explained before assumptions are made that mobile broadband will spread quickly across the developing world.

---

<sup>28</sup> See *List of mobile network operators in the Americas*, Wikipedia (October 7, 2012); also *List of UMTS Networks* at [http://en.wikipedia.org/wiki/List\\_of\\_UMTS\\_networks](http://en.wikipedia.org/wiki/List_of_UMTS_networks), and *3G Operator List by Country* at <http://phone-solutions.pavemyway.com/3G-Operators/3G-Operators-List.php>

<sup>29</sup> *Ibid.*

---

## The Latin American cases

The Latin American markets that appear among both sets of broadband leaders (fixed and mobile) also have some distinct characteristics. They differ with respect to the average age and average household size of their populations - with Argentina higher on the former and Mexico on the latter - but have vertical income distributions, large territories, and competing telephone and cable TV companies. They also have the highest GDP per capita of the countries on the two lists yet rank only ninth and tenth with respect to broadband penetration.

At the same time, both of the Latin American countries have relatively educated populations, including a relatively pervasive understanding of English, which gives their Internet users bi-lingual access to a very large base of sites on the web. Mexico is also a major Spanish-language content producer for the Latin American and Hispanic markets. New mobile applications are thriving and Blackberry handsets are considered status symbols.

Nonetheless, other markets are likely to surpass their broadband penetration rankings over time, most likely involving countries with lower incomes but more horizontal income distributions. On the fixed broadband side this is likely to happen first in Argentina where a greater portion of the households already subscribe to broadband. There are not as many upper-income and middle-class households left to adopt the service as there are in Mexico. On the other hand, in Buenos Aires there are three main fixed broadband operators and several secondary ones, which keeps prices competitive and supports market growth.<sup>30</sup>

On the mobile side, the respective governments have initiated the process of issuing 4G licenses, indicating confidence in the growth of data applications and services. However, in Argentina the related spectrum auction was recently suspended with the government assigning the spectrum to a state-owned satellite operator (NEWLANDS, 2012).

---

<sup>30</sup> The fixed broadband market is largely divided between Telefónica de Argentina (which offers ADSL services branded Speedy), Telecom Argentina (ADSL services branded Arnet), and Grupo Clarín (cable modem services branded FiberTel). Mobile operator Claro is a small but growing competitor in the broadband market, and there are several other minor providers, according to Budde.com.

Given the leadership positions of Argentina and Mexico, why are countries such as Colombia not among broadband leaders? Columbia's troublesome public environment could have stimulated fixed broadband use, in that it presumably increased time spent indoors. Yet with a high Gini coefficient (55.9) Colombia's fixed broadband penetration is less than half of Mexico's and its mobile broadband was non-existent as of the end of 2010 due to a lag in licensing of 3G service operators.

### Malaysia's mixed record

Of the other emerging broadband leaders Malaysia stands out due to the effort the government has placed on fostering broadband growth. Following Korea's lead, Malaysia has tried to instigate a broadband surge since the late 1990s. It led with the Multimedia Super Corridor initiative (1996), then a National Broadband Plan (2002), and then the Five-Year ICT Blueprint (2004), all aiming to establish Malaysia as a regional and global communications hub. Yet, as has happened elsewhere, these initiatives were stymied by resistance from Malaysia's incumbent carrier, Telecom Malaysia (TM).

Due to its near monopoly of last mile connections, TM remains the sole significant DSL broadband provider in the country, with the ability to control prices (see table below, showing its Consumer ADSL offerings). The prices that TM offered in late 2012 were unlikely to open up the market dramatically, as the government has hoped.

**Table 3 - TM Streamyx Consumer ADSL Pricing in Malaysia (2012)**

<i>Downlink</i>	<i>Uplink</i>	<i>Cost</i>	<i>Notes</i>
384Kbps	128Kbps	\$6.52/10 hours	Extra minutes charged
512Kbps	256Kbps	\$14.34/60 hours	Extra minutes charged
1Mbps	384Kbps	\$32.27/Month	\$28.69 without modem
2Mbps	384Kbps	\$61.29/Month	Including modem
4Mbps	512Kbps	\$87.38/Month	Including modem

*Source: Kalba International, Inc., based on TM website (October 8, 2012)*

In principle Malaysia's market structure is now undergoing dramatic change, with four 3G players, four WiMAX operators, and FTTH to be provided by TM as part of the Government's High Speed Broadband (HSBB) project. Specifically, the government allocated 12.9 billion MYR (\$3.7 billion) for its 2006-2010 ICT Blueprint plan, which spurred a step-function increase



in penetration in 2009.<sup>31</sup> The FTTH network is expected to cost approximately US\$ 2-3 billion, with the government paying approximately US\$ 0.7-0.8 billion of the cost in subsidies. The primary driver of take-up is expected to be faster broadband access (over 20Mbps), with IPTV services further stimulating demand.<sup>32</sup>

In conclusion, Malaysia has made major strides in ICT development for a medium-income country, yet its 15-year effort in government-supported broadband initiatives has not translated into high levels of fixed broadband penetration, particularly outside the high-density Klang Valley area. The major telecommunications growth in Malaysia has been on the mobile side, where 3G penetration reached 26.75% at the end of 2009. On the fixed broadband side TM continues to exercise a facilities bottleneck, with the government testing whether direct intervention and funding will benefit the country's economic competitiveness and social development.<sup>33</sup>

## The fixed-mobile relationship

This brings us to the key relationship between fixed and mobile broadband in emerging markets. Conventional thinking suggests that mobile broadband provides a full-scale alternative to the achievement of broadband connectivity in countries with limited fixed infrastructure, especially where neither most individuals nor the society as a whole can afford extensive fixed and mobile infrastructures. On the other hand, we see that there is a large overlap between mobile broadband leaders and fixed broadband leaders. So how to explain these inconsistencies?

First of all, the average incomes of the two groups of countries - those with high fixed and mobile broadband levels versus those with high mobile broadband penetration only - are virtually equivalent. So income level per se is not a key differentiating factor. More likely we are dealing with a difference in legacy networks, a difference in levels of competition between

---

<sup>31</sup> *Point Topic Operator Source Newsletter*, Malaysia Broadband, Oct. 9, 2009.

<sup>32</sup> Based on interviews with Malaysian telecom industry representatives familiar with the HSBB rollout.

<sup>33</sup> The slow rollout of broadband services also forced the government to lower its household broadband penetration target from 75% in 2010 to 50%. See *Point Topic Operator Source Newsletter*, Malaysia Broadband, 9 Oct 2009.

the mobile and fixed sectors (as reflected in retail prices), or a difference in some aspect of demand.

In fact, to some degree, all of these factors are likely to be at play. For example:

- The East European and Latin American countries generally have more extensive legacy telephone infrastructures and, in more cases, competing cable TV operations - than the African and Asian countries where mobile broadband is better established than fixed broadband.
- The African countries generally have younger populations and/or less formally educated ones as well as more nascent information-based service sectors than do the East European and Latin American leaders, which have dual-broadband (fixed and mobile) operating environments.
- The mobile-only or mobile-primarily leaders, such as Botswana, Malaysia, and South Africa, are also more likely to have incumbents that have managed to preserve their monopolies in fixed lines, in part because they have remained state-owned, which has limited competition in broadband delivery - and they generally do not face cable TV-based competition.

At the same time, both sets of countries have obviously managed to generate mobile competition and a reasonable pricing of mobile broadband services in the context of their middle-income economies. After all, in one subset of countries (Bulgaria, Romania, Argentina, etc.) the market supports a large number of mobile broadband subscriptions in addition to a relatively large base of fixed broadband subscriptions. (Whether these are largely distinct or largely overlapping individuals remains unclear, and is certainly an important question that researchers should address.) In the other subset (Malaysia, South Africa, Botswana, etc.), individuals and enterprises with limited indications of a predisposition to broadband connectivity in traditional terms (as reflected in fixed broadband adoption, income and education levels, industry profiles, etc.) are nonetheless intensive subscribers to mobile broadband services.

What is much harder to determine is what use the two subsets of countries - and their respective subscribers - make of mobile broadband. Does mobile broadband play the same role - or different roles - in their respective media ecologies? For example, do the countries with dual broadband leadership positions reflect somewhat differentiated broadband roles - with fixed broadband being the workhorse of business users and intensive digirati while mobile broadband responds to more casual usage

needs? Does income or education differentiate between those that use both forms of broadband and those that use the mobile version only?

Conversely, in the mobile-only leader countries, how can the broadband usage of mobile best be characterized? It is important in this context to keep in mind that many so-called "mobile broadband subscribers" represent voice users that have been migrated by their operators to 3G networks principally for spectrum management purposes; some do not even have smartphones. But as for those using 3G for non-voice purposes, what are the main applications involved (social networking, games, work-related uses, video, etc.) and are these largely the same or different than in the countries with extensive fixed and mobile broadband usage? In short, what are the buyers of smartphones, which are racing off the store shelves of mobile retailers from Johannesburg to Kuala Lumpur to Mexico City doing with them, other than impressing their friends?

The underlying issue here is to discover whether the two contexts of bi-modal and single-mode use of broadband are really distinct or highly similar. If they are distinct, then broadband evolution may follow quite different paths in the two types of countries (e.g. those with and without relatively large Internet subscriber bases). Also, low-income countries with incomes per capita of less than \$2500 are much more likely to follow the single-mode development pattern as they rarely have extensive legacy networks (i.e. fixed) and rarely benefit from widespread computer availability. So will this mode of broadband adoption and use favor relational (e.g. social media) and entertainment (e.g. games) applications while the dual-mode environment support business and more text-based applications as well as higher bitrate video ones?

In sum, fixed and mobile broadband complement each other among a large subset of the broadband leadership markets. Yet there are markets that have diverged from this complementary model - both mobile-dominated broadband leaders such as South Africa and the fixed-dominated ones such as the East Caribbean island nations. This paper calls for careful assessment of these alternative development models, as we may see them replicated increasingly among tomorrow's frontier broadband markets.

## ■ Findings and conclusions

This review of broadband leaders across emerging markets has raised as many questions as it has answered. This is in part a reflection of the broad geographical and analytical perspective that has been used in examining broadband development in this paper.

Nonetheless there are some general conclusions that flow from the review.

First, the presence and use of broadband connectivity has been most apparent in markets that combine legacy fixed infrastructure and competing mobile markets. On the demand side, these markets (mainly in Eastern Europe and parts of Latin America) are relatively urbanized, have relatively small households and ageing populations (with the notable exception of Mexico), significant disposable income, and proximity in most cases to developed markets where broadband is becoming a staple of living in the information age. They are also mostly markets with relatively low Gini coefficients - in other words, relatively flat income distributions.

Other emerging markets in Africa, Asia and the Caribbean have achieved broadband leadership positions in either the fixed or mobile broadband arenas, including Grenada, Malaysia, Mauritius, St. Lucia, and South Africa. These markets are less robust when it comes to broadband than the first group but they have each found a way to excel on a more niche-like basis. These markets generally have more mixed profiles in terms of the demand characteristics that form ideal broadband-using environments - education levels, household size, adherence to major language groups, and the presence of information-based service industry.

The question going forward is whether the latter types of markets - both those of the leaders and others with lower broadband penetration rates but similar structural characteristics - have staying and growing power? Will markets such as South Africa's, where income inequality, already high, has been growing, be able to sustain robust broadband development other than in limited areas with high-income households or information-based businesses? Will broadband delivered on a mobile prepaid basis at limited download speeds and a limited array of "popular" applications thrive in an environment with limited Internet usage and subscribers?

Understanding the extent to which this will happen - and whether there will be significant variations in how it happens across countries and across

market segments in the same country - is the challenge that researchers, operators and policy setters face in today's increasingly global domain. What this paper has hopefully contributed in addressing this challenge is a demonstration that there is no single path to broadband leadership in emerging markets. At the same time it has shown that most leading broadband markets in middle-income markets surprisingly hold many features in common. This suggests that the broadband future in emerging and frontier markets will be reached by two paths - a relatively reliable one and another that is more inventive albeit more risky.

### References

BENKLER Y. (2009, October): "Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world", Berkman Center for Internet and Society, Harvard University, pp. 35-36.

FLOW (2011): *Developing and Promoting ICT in Grenada*.

KALBA, K.:

- (2008, December): *The Global Adoption and Diffusion of Mobile Phones*, Harvard Program on Information Resources Policy.

[http://pirp.harvard.edu/pubs\\_pdf/kalba/kalba-p08-1.pdf](http://pirp.harvard.edu/pubs_pdf/kalba/kalba-p08-1.pdf)

- (2008): "The Adoption of Mobile Phones in Emerging Markets," *International Journal of Communication*, Vol. 2.

KIM Y., T. KELLY & S. RAJA (2010): *Building Broadband: Strategies and Policies for the Developing World*, The World Bank, Washington D. C..

NEWLANDS M. (2012): "Argentina cancels auction and awards spectrum to state-owned firm," *PolicyTracker*, Sept. 24.

Ovum Consulting (2010, January): *Broadband Policy Development in the Republic of Korea - A Report for the Global Information and Communications Technologies Department of the World Bank*.

PARK Y.-J., KIM H. S. & KO H.-J. (2002, June): *Household Projections for the Republic of Korea*, National Statistical Office, Republic of Korea.

WHALLEY, J. & P. CURWEN (2012): "Incumbency and market share within European mobile telecommunications networks," *Telecommunications Policy*, 36 pp. 222-236.