Asia Pacific Mobile Observatory 2011

Driving Economic and Social Development through Mobile Broadband

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Geographic Scope of this Study

With 47 countries, 3.7 billion people, hundreds of cultures as well as thousands of languages and dialects, Asia Pacific is the most diverse region in the world. Referring to Asia Pacific in singular form without considering the intricacies and complexities among and within its countries ignores the wholeness and richness of this diversity. However, it would be impossible to profile each of the 47 countries in this report in the thoroughness they deserve. Therefore, the focus of this report is on the 99% of subscribers in Asia Pacific who live in 17 countries as shown below. These 17 markets (hereafter referred to as AP17) are extremely diverse economically, culturally, geographically and politically and therefore are a good representation of Asia Pacific as a whole.

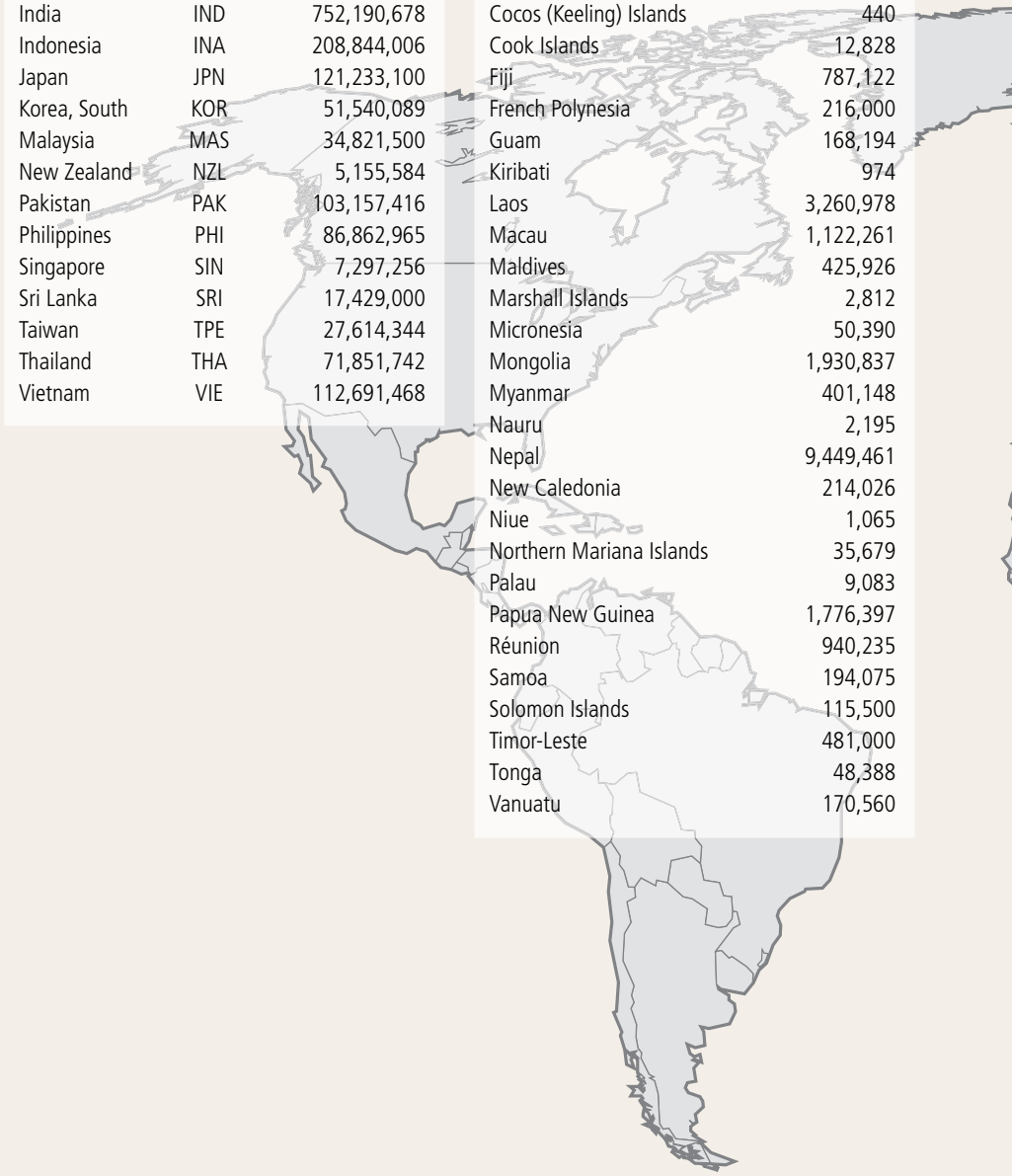
Asia Pacific Geographic Scope (AP17 and AP47)[1]

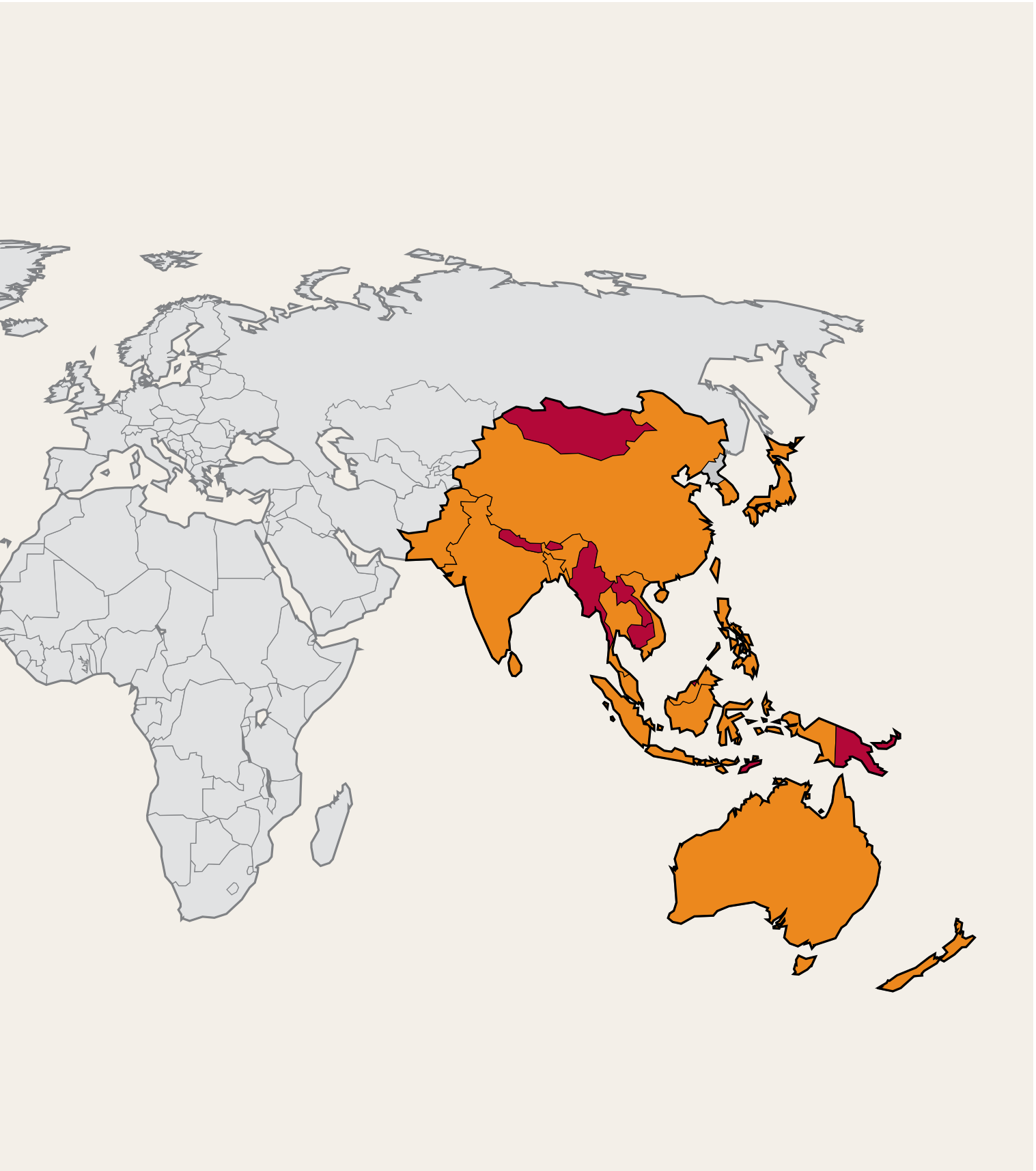
AP17 Countries

Country	Label	2010 Total Connections
Australia	AUS	28,102,000
Bangladesh	BAN	72,992,005
China	CHI	841,963,000
Hong Kong	HKG	10,769,151
India	IND	752,190,678
Indonesia	INA	208,844,006
Japan	JPN	121,233,100
Korea, South	KOR	51,540,089
Malaysia	MAS	34,821,500
New Zealand	NZL	5,155,584
Pakistan	PAK	103,157,416
Philippines	PHI	86,862,965
Singapore	SIN	7,297,256
Sri Lanka	SRI	17,429,000
Taiwan	TPE	27,614,344
Thailand	THA	71,851,742
Vietnam	VIE	112,691,468

Countries outside AP17

Country	2010 Total Connections
American Samoa	43,339
Bhutan	425,609
Brunei Darussalam	552,588
Cambodia	9,902,106
Cocos (Keeling) Islands	440
Cook Islands	12,828
Fiji	787,122
French Polynesia	216,000
Guam	168,194
Kiribati	974
Laos	3,260,978
Macau	1,122,261
Maldives	425,926
Marshall Islands	2,812
Micronesia	50,390
Mongolia	1,930,837
Myanmar	401,148
Nauru	2,195
Nepal	9,449,461
New Caledonia	214,026
Niue	1,065
Northern Mariana Islands	35,679
Palau	9,083
Papua New Guinea	1,776,397
Réunion	940,235
Samoa	194,075
Solomon Islands	115,500
Timor-Leste	481,000
Tonga	48,388
Vanuatu	170,560





1. Executive Summary

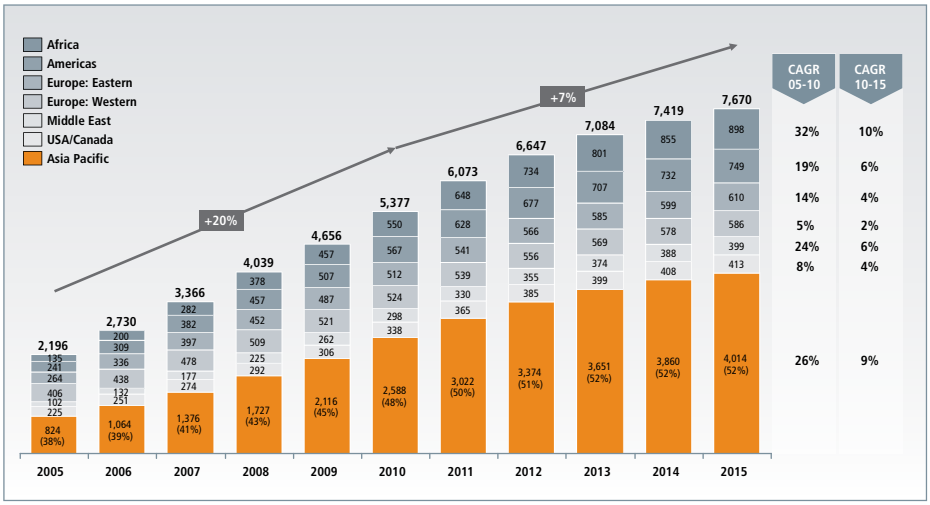
The 2011 Asia Pacific Mobile Observatory updates and expands on the first Asia Pacific Mobile Observatory carried out in 2009. With new data, analysis and insight it provides a comprehensive reference point for participants in the mobile industry, policy makers and other interested stakeholders.

This year's report focuses especially on the positive economic and social impact of mobile broadband, which is having a transformative effect across Asia Pacific. The innovative Mobile Broadband Readiness Index aims to show how the AP17[i] countries compare against one another from a 'readiness' perspective and identify the means to sustain growth from a market, regulatory policy and corporate strategy perspective.

Executive Summary

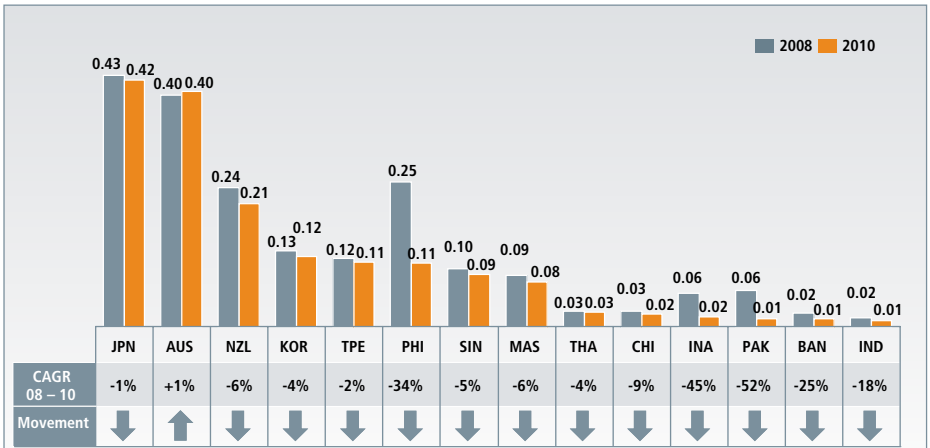
Asia Pacific is the largest mobile market in the world, and is continuing to show strong growth. Asia Pacific accounts for half of the total mobile connections in the world, with 3 billion lines. Looking ahead, the region is expected to continue its strong growth, adding a further 1.5 billion connections between 2010 and 2015 – similar in scale to the achievements of the last five years when 1.7 billion new connections were added. This growth and scale is encouraging for consumers and investors alike, as the industry has shown resilience through the global economic crisis by continuing to invest funds to improve the quality of mobile services across the region.

Figure A: Global Mobile Connections[ii]
(in millions)



The Asia Pacific mobile market is highly competitive. 13 of the 17 major markets ("AP17") in Asia Pacific have at least five network operators, while India has as many as fifteen. This is contributing to rapidly declining prices and operator margins in most markets. Despite intense competition, falling prices and margins, operators in Asia Pacific's major markets have invested an average of 16.3% of their revenues into capital expenditure, significantly higher than their counterparts in other geographies. Furthermore, they have repaid investor confidence – operators in developing Asia Pacific countries have reported above-average equity performance, beating every other region globally.

Figure B: Average Effective Price Per Minute for Selected AP17 Markets[ii]
(in US$)



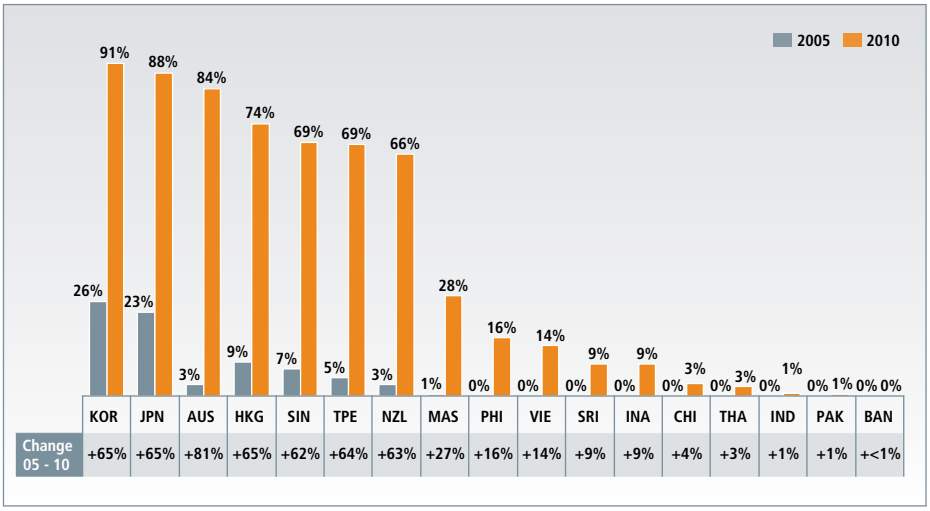
Note: (1) Data not published for Hong Kong , Sri Lanka and Vietnam
(2) Q1 2008 US$ exchange rate applied for all markets

i The focus of this report is on the 99% of subscribers in Asia Pacific who live in 17 countries: Australia, Bangladesh, China, Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Philipines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam. These 17 markets (hereafter referred to as AP17) are extremely diverse economically, culturally, geographically and politically and therefore are a good representation of Asia Pacific as a whole.

ii Wireless Intelligence 2011, A.T. Kearney Analysis

Mobile broadband and data services are transforming the landscape. By 2015 Asia Pacific is expected to account for 40% of global data traffic. Mobile broadband is booming across the Asia Pacific region, increasingly becoming the standard conduit to access the Internet, partly driven by rapid 3G network rollouts. In all developed Asian markets mobile service coverage now stands at over 95% while the likes of Malaysia and Indonesia have also achieved population coverage of over 80% – especially impressive given the topography of these countries. As a result, the breadth of applications and services delivered over mobile networks is booming. For example, by 2020 there will be an estimated 5.3 billion M2M connections in Asia Pacific.

Figure C: Mobile Broadband Penetration 2005 vs. 2010 in AP17 markets[iii]



The inaugural Mobile Broadband Readiness Index (MBRI) indicates that countries creating an ecosystem conducive to growth in mobile data services have the potential to make rapid leaps ahead of their peers. In 2011 we saw Japan rise up to the top of the index above Singapore, driven by its early 4G rollout and its pro-innovation environment. Hong Kong and Vietnam also jumped ahead, demonstrating their strong commitment to fostering a successful mobile broadband landscape. Different stages of market evolution will require different strategies to ensure that growth can be sustained.

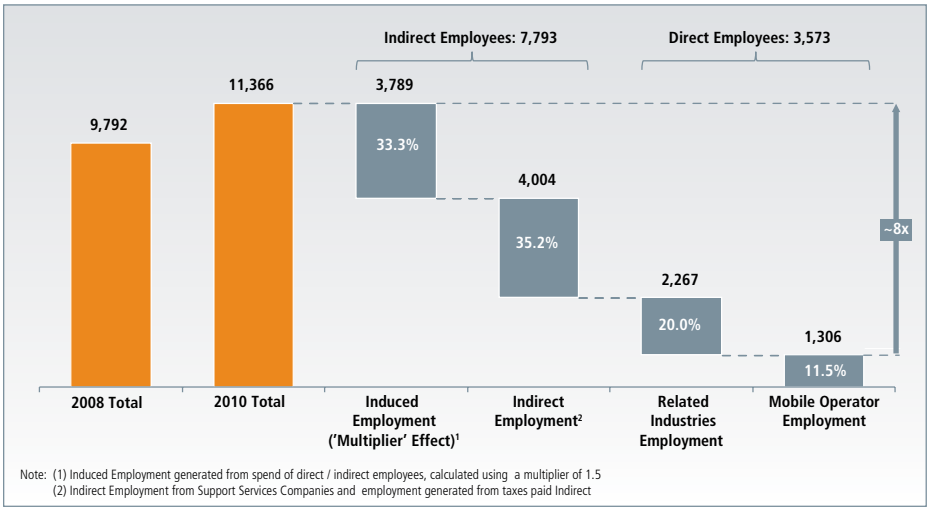
The mobile sector is a major contributor to Asian economic growth. The industry accounts for an estimated US$485 billion, or 2.7% of GDP, across the 17 major AP17 countries. It also accounts for 11.4 million jobs – for each job created by a mobile operator, there are eight more generated in the mobile ecosystem and wider economy. In terms of contributions to public funding, almost US$300 billion was generated through various taxes and fees in 2010. Overall, the positive impact of the mobile sector in terms of job creation, public funding and productivity improvement will play a key role in leading slowing economies away from potential recession. This relies on both the players in the mobile ecosystem and a conducive operating environment based on regulatory policies that will drive increased coverage, penetration and mobile phone usage, which in turn will lead to increased economic prosperity.

Figure 4: The Mobile Broadband Readiness Index 2011

2011	Country	MBRI Score 2011	Change in Rank vs. 2009
1	**Japan**	78.7	+1
2	**Singapore**	75.2	-1
3	**Hong Kong**	71.5	+2
4	**Australia**	70.8	-1
5	**South Korea**	66.9	-1
6	**New Zealand**	61.7	0
7	**Taiwan**	57.1	0
8	**Malaysia**	48.8	0
9	**Vietnam**	35.6	+4
10	**Indonesia**	33.3	-1
11	**China**	30.8	0
12	**Sri Lanka**	27.4	-2
13	**Philippines**	25.0	+1
14	**India**	20.2	+1
15	**Thailand**	20.0	-3
16	**Pakistan**	9.9	0
17	**Bangladesh**	6.1	0

iii ITU, EIU, Wireless Intelligence 2011, A.T. Kearney Analysis

Figure D: Mobile Ecosystem Contribution to Employment in AP17[iv]
('000 Employees)



Note: (1) Induced Employment generated from spend of direct / indirect employees, calculated using a multiplier of 1.5
(2) Indirect Employment from Support Services Companies and employment generated from taxes paid Indirect

The mobile sector is having a transformational impact on society. As well as the social, environmental and charitable initiatives led by mobile operators, the industry is making a profound collateral impact on society by creating efficiencies in everyday communication, productivity and knowledge. Communication is more efficient than ever before, with mobile platforms providing a basis for instant social and professional connections. Productivity efficiencies come from data-enabled mobile devices providing greater flexibility in where we process information, allowing us to lead more productive lives and businesses to be more efficient in their delivery of goods and services. Knowledge efficiencies have enabled markets to function more efficiently and the unprecedented ability of consumers to access any information, anytime, anywhere and can provide a deep social, intellectual and financial advantage.

Regulators play a critical role as enablers of future mobile-driven economic and social development. The industry must continue to grow, in order to facilitate further economic and societal change across Asia Pacific. Effective regulatory policy-making is potentially the most important influencer of growth. Discussions with several players within the ecosystem identified five key regulatory themes that need addressing within an Asia Pacific context:

1) Optimising spectrum allocation and licensing
2) Driving effective taxation and deployment of government funds
3) Rebalancing regulatory frameworks to address new players in the growing mobile ecosystem
4) Developing a sustainable model for mobile internet, by proactively addressing net neutrality concerns
5) Allowing the market to address mobile data roaming charges

Progressive regulatory bodies that instigate and shape policy must do so by looking at the industry through a 'wide angle-lens', addressing the wider mobile ecosystem and ensuring that their policies continue to enable the industry to benefit its consumers, generate value and drive social development and economic growth.

iv Wireless Intelligence 2011, BoA Merrill Lynch Wireless Matrix, IDC, Ovum, TIA, PwC, Informa, Telenor, A.T. Kearney Analysis

2. Asia Pacific: Driving the Global Mobile Sector

Key Messages:

As of 2011 Asia Pacific (APAC) already represents approximately one half of the world's total connections with 3 billion lines – more than twice that of North America and Europe combined

The APAC mobile industry has been growing at a phenomenal rate of 26% since 2005 and will continue to be the main global growth driver in the telecoms industry

There are 47 countries in APAC, characterised by huge cultural, economic and consumer differences, but only 17 countries contribute ~99% of the total connections

Mobile penetration rates have grown rapidly across the region – but over a billion people remain unconnected in China and India alone, representing significant growth potential

The AP market is highly competitive, which is contributing to declining prices and EBITDA margins in most markets

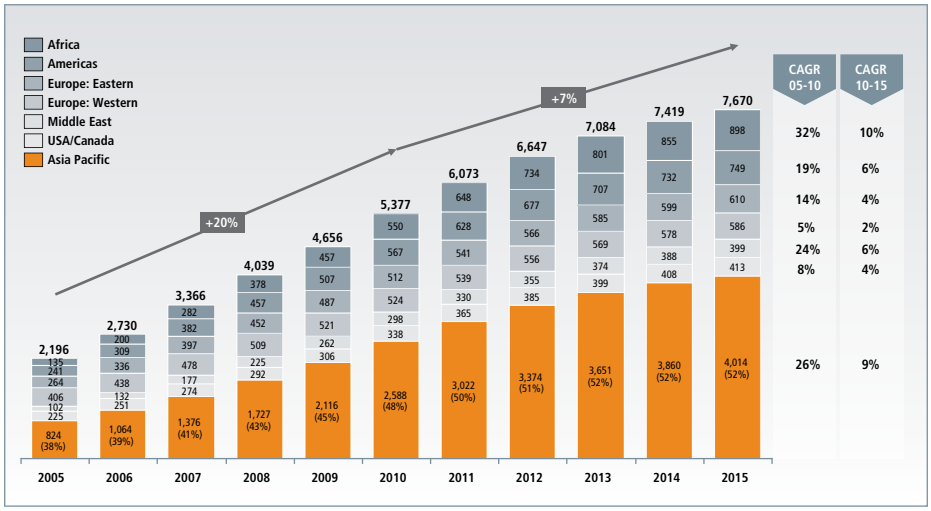
Encouragingly, the industry has shown resilience through the global economic crisis, and a continuing willingness to invest to improve the quality of mobile connectivity across the region

2.1 Asia Pacific: Scale, Growth and Diversity

At the turn of the century, Asia Pacific had overtaken almost every global region in terms of mobile market connections, only falling short to Europe – a benchmark which was soon surpassed by the end of 2002. Asia Pac has thus cemented its place as the world's largest mobile market, continuing its phenomenal growth through the decade to 2.6 billion connections in 2010 (see Figure 1).

As the total global mobile market now grows beyond 6 billion connections, 2011 is expected to be another landmark year for Asia Pacific as it crosses the 3 billion connections mark for the first time – two years earlier than projected in the 2009 GSMA Observatory Report. By the end of 2011 Asia Pacific will account for half of the world's total connections.

Figure 1: Global Mobile Connections[v] (in millions)



The Asia Pacific mobile market is weathering the global economic slowdown and retaining its place as one of the fastest growing mobile markets, highlighting the ubiquity of mobile more than ever before. Between 2005 and 2010, the region's mobile market showcased historical growth of 26% CAGR, with a slowdown in the projected annual growth rate in the subsequent five years to 9%. Despite this, Asia Pacific market growth in 2010 to 2015 will be at least twice the rate of Europe and North America. The region is expected to add nearly as many connections between 2010 and 2015, at 1.5 billion, as it did over the previous five years, when 1.7 billion new connections were made. This reflects the unrivalled scale and potential of the industry in the region.

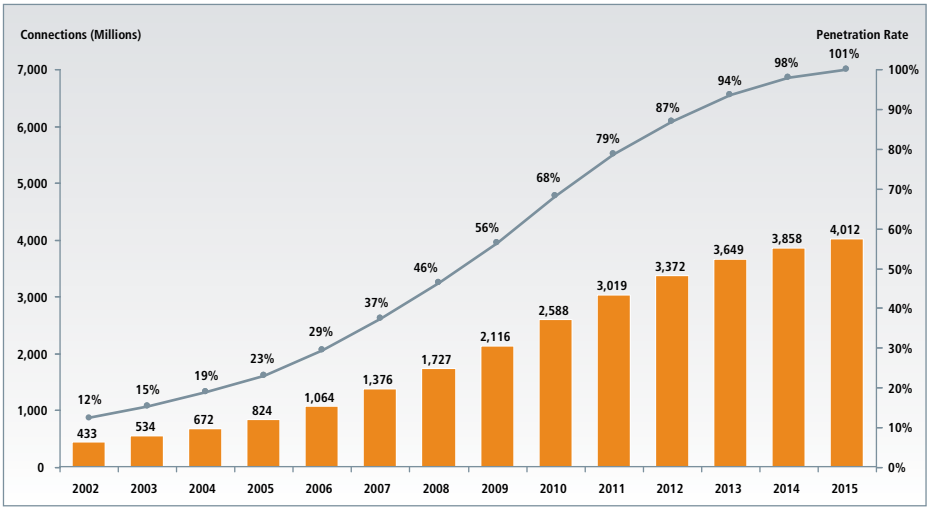
v iWireless Intelligence 2011, A.T. Kearney Analysis

This impressive growth achieved in Asia Pacific has been driven by several key factors:

- Rapid economic development in the region, increasing citizen prosperity and hence the affordability of communications services
- The opening of markets to the forces of globalisation and foreign direct investment
- The ambitious investment in mobile network infrastructure by operators, with many operators across the region already driving 4G rollouts
- The success of cost-effective pre-paid services (84% of Asia Pacific connections versus 66% in Europe and 15% in USA/Canada) allowing consumers to take control of their spending and gain access to flexible, low-cost voice and SMS services
- The introduction of low-cost handsets and the reduction in mobile usage prices driving down the minimum total cost of mobile ownership
- Innovative business models including infrastructure-sharing and unique distribution strategies making the expansion of network coverage to rural areas economically viable to operators and consumers
- Limited fixed line infrastructure, which is driving consumers in many markets to use mobile as their primary communication channel.

These factors have contributed to the growth in penetration of mobile services in Asia Pacific from just 12% in 2002 to 68% in 2010 (see Figure 2). As impressive as this is, it also highlights the potential and need for substantial growth to connect the remainder of the Asia Pacific population. Mobile penetration is expected to extend to almost 80% of the population by the end of 2011.

Figure 2: Asia Pacific Connections and Penetration Rate[2]



The diversity of Asia Pacific is unparalleled, with 47 countries, a recorded population of 3.7 billion people, hundreds of cultures, and thousands of languages and dialects. In fact, Asia Pacific is home to some of the largest and smallest countries in the world by various measures:[3]

- **Population:** China: 1.32 billion [#1/238], Niue: 2,100 [#235/238]
- **Area:** China: 9.6 million km^2 [#4/250], Nauru: 22 km^2 [#239/250]
- **Population Density:** Macau: 20,465/km^2 [#2/238], Mongolia: 2/km^2 [#233/238]
- **GDP Per Capita:** Singapore: US$62,100 [#5/227], Nepal: US$1,200 [#209/227]
- **Literacy Rates:** Japan: 99%, Bangladesh: 48%
- **Languages:** China alone has seven known variations of the Chinese language, the Tibeto-Burman language family has 12 variations, and India has more than a hundred widely spoken languages, and over a thousand mother tongues.

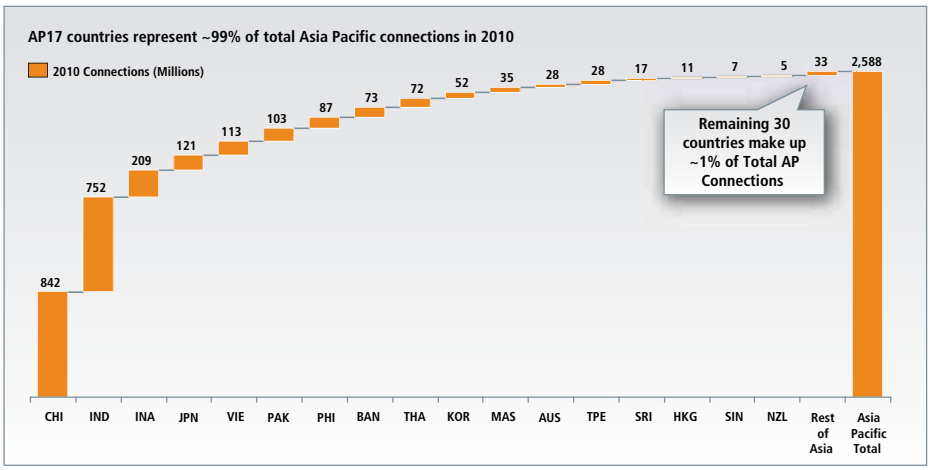
Referring to Asia Pacific as a single, all-encompassing entity, without considering the intricacies and complexities among and within its counterparts ignores the wholeness and richness of this diversity. Asia Pacific is equally nuanced from a telecommunications perspective with vast and varying degrees of differences in the characteristics of its 47 mobile markets.

Some examples include:[4]

- **Penetration:** Macau: 216%, Myanmar: <1%
- **Total Connections:** China: 840 million, Norfolk Island: 130
- **Number of Countries with 3G Network Availability:** 35 out of 47 (compared to 22/47 in 2008)
- **Data Revenues as a Percentage of Total Revenues:** Philippines: 50% , Thailand: 11%
- **Pre-paid Connections as a Percentage of Total Connections:** Laos: 98.9%, South Korea: 0.8%

Taking into account the extent of the region's diversity in both macro-economic environment and mobile characteristics, it is impossible to profile each of the 47 countries in this report with the depth and thoroughness they require. Additionally, the availability and reliability of data varies perhaps as much as the diversity of these countries. Therefore, the focus of this report will be on the 99% of subscribers in Asia Pacific who live in the 17 countries (see Figure 3). These 17 markets (hereafter referred to as AP17) are extremely diverse economically, culturally, geographically and politically, and therefore may be considered a fair representation of Asia Pacific as a whole.

Figure 3: AP47 and AP17 Connections Breakdown[5]



For the purposes of this report, countries outside AP17 will be covered through case studies and anecdotes to highlight their unique characteristics, noteworthy market moves and cutting-edge innovations.

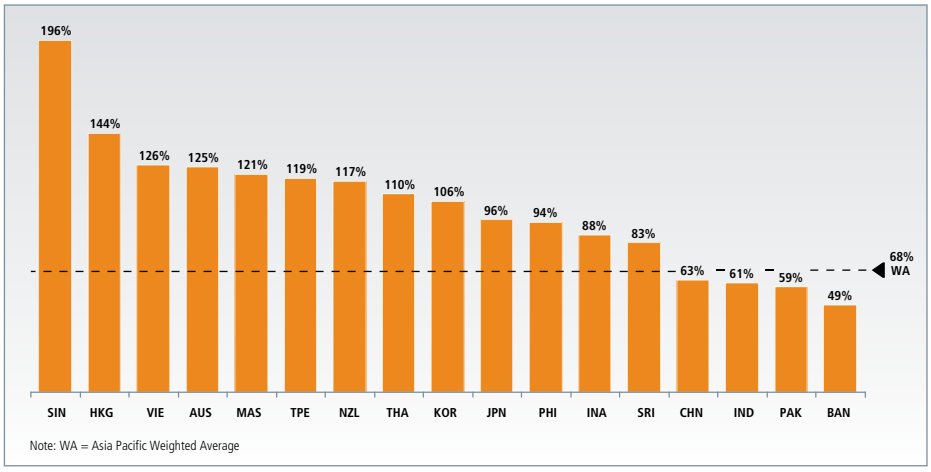
2.2 Booming Connectivity

Figure 3 shows that six countries – China, India, Indonesia, Japan, Vietnam and Pakistan – now have over 100 million connections, together contributing to 83% of total AP17 connections. Four in ten of the total number of connections on the planet at the end of 2010 were in one of these six countries. As a single country, China's current total connections base of 842 million already exceeds the total number of connections in Europe and the US combined.

Nevertheless, in India and China especially the number of connections still falls well short of the population, indicating huge growth potential. Both countries have penetration rates at little over 60%, which implies that approximately a billion people in these two countries alone are still without a mobile connection. In reality this figure is likely to be even higher, given that some existing customers have more than one line.

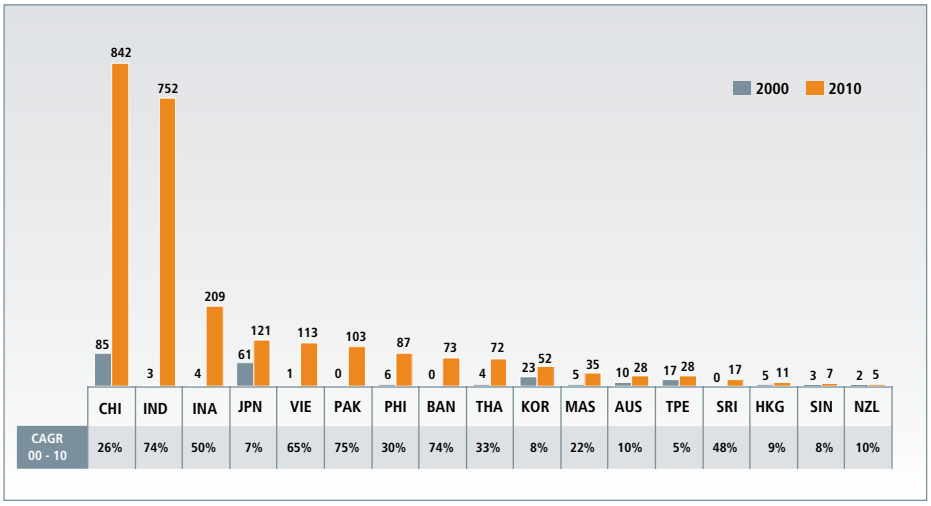
Generally, the mobile penetration rate across AP17 varies considerably (See Figure 4), reflecting the differences in maturity, development and subscriber usage characteristics among the region's markets. For example, penetration rates in Singapore and Hong Kong exceed 140%. In fact, nine of the countries among AP17 have penetration rates exceeding 100%, in other words there are more connections than people in the country. At the other end of the scale, Pakistan and Bangladesh still have penetration rates below 60%. Some markets outside of AP17 are even further behind. The Republic of Nauru only enjoyed mobile communications for the first time in late 2009 with the launch of the Digicel network. By the end of 2010, Nauru's penetration rate had already reached 16%.

Figure 4: AP17 Mobile Penetration Rate[6]



The majority of countries within AP17 saw double digit annual growth in total connections between 2000 and 2010 (See Figure 5). The South Asian countries have experienced astounding growth in the number of connections, with an average annual growth rate of 74% for both Bangladesh and India and 75% for Pakistan. Vietnam has also shown remarkable penetration growth in the last decade with 65% CAGR. In contrast, the developed markets in Asia Pacific have grown at high single-digit growth rates, comparable to markets in Western Europe, reflecting the fact that many of these markets have reached maturity with high penetration rates.

Figure 5: AP17 Connections 2000 vs. 2010 Comparison[7] (in millions)



	CHI	IND	INA	JPN	VIE	PAK	PHI	BAN	THA	KOR	MAS	AUS	TPE	SRI	HKG	SIN	NZL
2000	85	3	4	61	1	0	6	0	4	23	5	10	17	0	5	3	2
2010	842	752	209	121	113	103	87	73	72	52	35	28	28	17	11	7	5
CAGR 00 - 10	26%	74%	50%	7%	65%	75%	30%	74%	33%	8%	22%	10%	5%	48%	9%	8%	10%

It is worth nothing that in many countries in Asia Pacific, the tendency to use multiple SIMs overstates the actual number of individuals with an active connection. Mobile customers use multiple connections for varying reasons including to take advantage of attractive promotions (long-distance rates, own-network rates, product bundles), and to split voice and data services to different handsets. In countries such as Indonesia and India, the multiple SIM phenomenon has been driven inadvertently by regulatory action, when spectrum was licensed at considerably cheaper rates for limited mobility CDMA offerings in order to drive adoption in place of traditional fixed lines.

However, this has also cannibalised full mobility offerings and individuals took advantage of the benefits of each type of technology. As the tariffs between CDMA and GSM continue to converge across the region, this will no longer be a driver for multiple SIMs. The expectation is that over time, multiple SIM card ownership will decrease, though it is unlikely to disappear as some people may still prefer owning multiple handsets and / or SIMs (data vs. voice or personal vs. work).

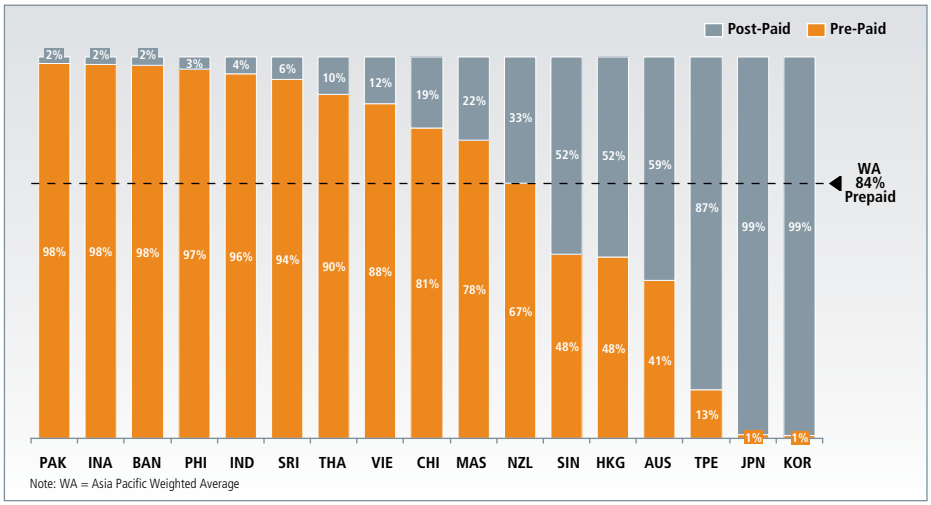
2.3 The Pre-paid / Post-paid Dichotomy

The introduction of pre-paid mobile services has been a key driver of the proliferation of mobile connections across Asia Pacific. Pre-paid pricing options offer mass-market consumers access to mobile services at a significantly lower entry cost than post-paid contracts. Perhaps more importantly, pre-paid services offer consumers with less financial stability and security the option of purchasing mobile credits only when they can afford to, as opposed to committing to an often-required one to three-year contract. Additionally, many developing countries in Asia Pacific have poor credit checking facilities. Offering post-paid services could prove detrimental to operators in determining an individual's ability to pay for mobile services; an issue further compounded by the challenge of payment collection. It is therefore not surprising that on average, 84% of total AP17 connections are pre-paid (see Figure 6), versus 66% in Europe and 15% in the US.

In fact, in seven countries among AP17, pre-paid connections make up almost the entirety (>90%) of their total connections. These seven countries are also amongst the less wealthy nations of the AP17. In contrast, Japan and South Korea have amongst the highest percentage of post-paid connections in the world (each with 99%). It would be misleading, however, to explain this fact in AP17 as a developed-market versus developing-market or a rich versus poor phenomenon. Doing so would disregard the fact that some of the more affluent and most developed markets in the world also have a substantial portion of pre-paid connections (more than half the countries in Western Europe have a pre-paid subscriber base exceeding 50% of total subscribers).

Other factors that contribute to the considerable differences in pre-paid versus post-paid connections include varying consumer needs, business models, historical market developments, education and awareness, and trust in the industry and / or businesses generally.

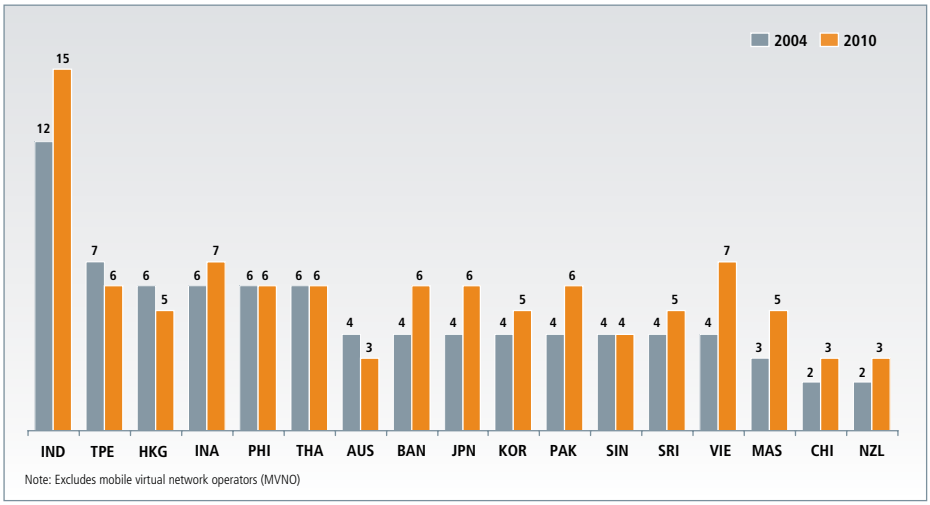
Figure 6: AP17 Prepaid Connections Relative to Postpaid Connections[8]



2.4 Competitive Intensity in the Asia Pacific Mobile Sector

Competition in wireless markets in Asia Pacific is among the most dynamic in the world. Thirteen countries in the AP17 have at least 5 wireless networks (see Figure 7). India, as an extreme example, had 15 mobile operators present in the market in 2010. Other countries have seen a gradual consolidation of operators between 2004 and 2010 with the most recent case being the proposed merger of first and third players, PLDT and Digitel, in the Philippines.

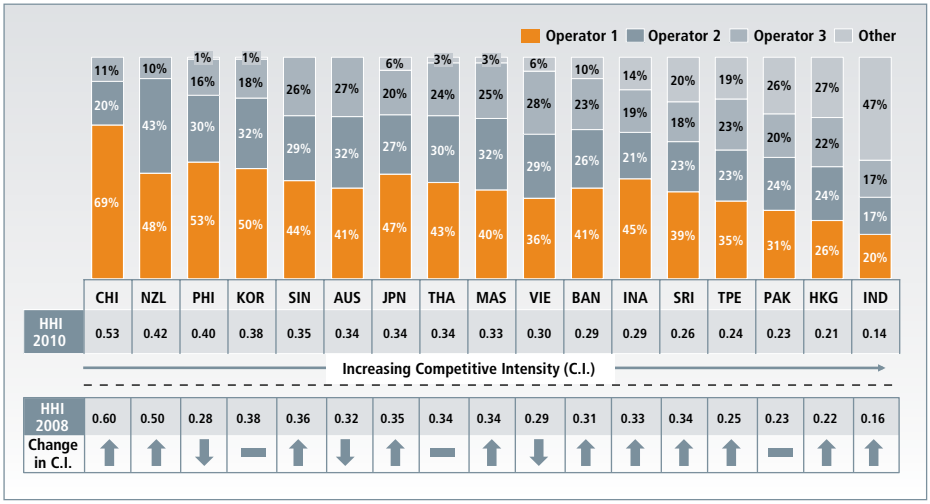
Figure 7: Number of Wireless Operators in AP17 Markets, 2004 vs. 2010[9]



Note: Excludes mobile virtual network operators (MVNO)

There is significant variation in the competitive intensity of Asia Pacific's mobile markets, as measured by the Herfindahl-Hirschman Index (HHI)[vi], as illustrated in Figure 8. Most interestingly, the two largest markets in Asia are at opposite ends of the competitiveness scale. At one end, the Indian market is most competitive with an HHI measure of 0.14. In India the largest of the 15 operators only has 20% market share and those outside the top three make up nearly half of total connections. At the other end of the scale the Chinese market has an HHI measure of 0.53, with the top two operators controlling nearly 90% of the market. When considering the AP17 as a whole, however, there is a healthy degree of competitiveness. All markets except two have an HHI measure of 0.40 or less (on a scale of 0 to 1), while half have an HHI measure of 0.30 or less.

Figure 8: Market Share of Operators and HHI Index for AP17[10]



vi The HHI Index is a standard measure of competitive intensity in a market, based on the number of players in the market and their respective market shares. Markets are measured on a scale of 0 to 1, where markets close to 1 have the lowest competitive intensity while those close to 0 are the most competitive

Although the differences between 2008 and 2010 are varied, with some markets showing little change, the overall picture is one of rising competitiveness. Twelve of the AP17 countries had a higher level of competitive intensity (i.e. lower concentration of market shares) in 2010, with the greatest changes in China, Sri Lanka and New Zealand. The Philippines has seen an increase in its HHI score, which was largely due to the consolidation of Piltel's cellular business, Talk 'n' Text, under market leader Smart in 2009.[11]

Also worth noting is that this only includes MNOs – factoring in the presence of MVNOs in many of these markets would further increase their competitive intensity. Australia, for one, has seen extraordinary growth in MVNOs – over half the MVNO's in Asia Pacific can currently be found in this country of 22 million people.[12] Within the 2009 – 2010 period, 18 MVNOs were launched in Australia, 11 in Hong Kong, and 10 in Japan. As growth slows in mature markets, operators are expected to pursue deeper consumer segmentation in their attempts to seek out additional revenues. In other markets, operators are expanding through brand partnerships; for example, the Indian regulatory environment's prohibition of the operation of MVNOs forced Virgin Mobile to enter the market through a brand partnership with Tata Teleservices in 2008.[13]

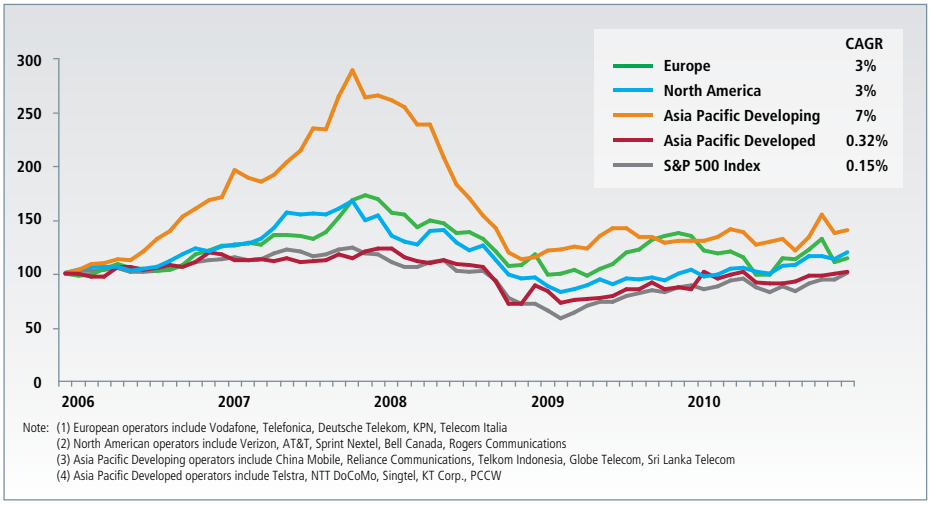
There is also intense competition in markets that have strong representation across both full mobility and limited mobility services, such as Indonesia and India. These markets have seen severe price pressure due to market forces, especially in recent years. As a large number of limited mobility subscribers do not travel much, they tend to use limited mobility services just as they would a full mobility GSM service. As a result, many of these markets do not enjoy a premium price over limited mobility (as many mature markets do vis-a-vis fixed line access). This has led to a further downward impact on full mobility GSM pricing.

Within various markets in Asia Pacific, there is a tremendous number of brands all competing against each other. In Indonesia for instance, there are over 15 brands across both post paid and prepaid segments, as well as the GSM and CDMA segments. Each of these has attempted a different value proposition targeted at individual customer segments, ranging from professionals, to homemakers, to labour workers and youth, to name a few. Across many markets, operators have begun to adopt a more sophisticated customer segmentation approach along with more innovative product offerings to capture or retain target segments.

2.5 Weathering the Global Economic Crisis

The Asia Pacific mobile sector has shown remarkable resilience through the global economic crisis. Telecoms equities have held up well, demonstrating ongoing investor confidence in the future of the sector. Across the globe, mobile operators have out-performed the S&P500, indicating strong market confidence in the sector's growth prospects. Operators in developing Asia Pacific countries have reported above-average equity performance, beating almost every other region globally, and outperforming the S&P 500 (see Figure 9).

Figure 9: Global Mobile Operator Equity Performance Index, 2005 – 2010[14]

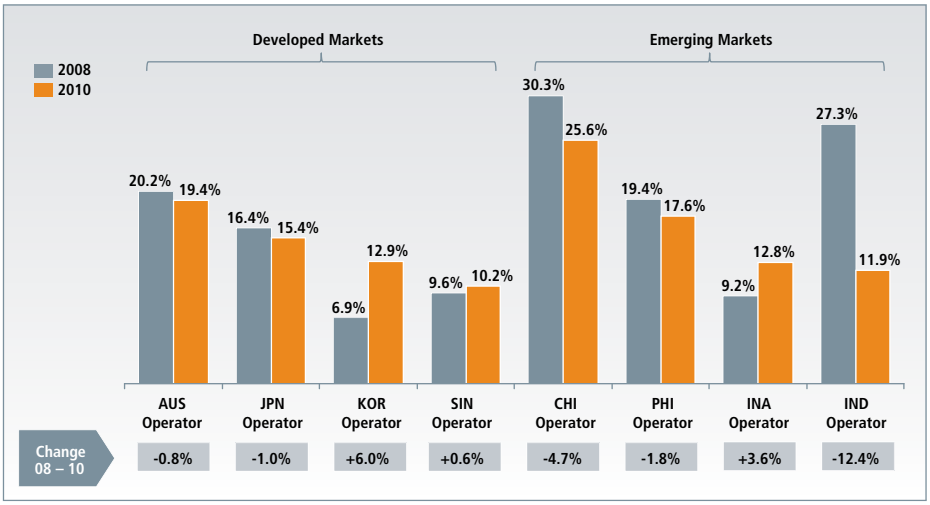


Note: (1) European operators include Vodafone, Telefonica, Deutsche Telekom, KPN, Telecom Italia
(2) North American operators include Verizon, AT&T, Sprint Nextel, Bell Canada, Rogers Communications
(3) Asia Pacific Developing operators include China Mobile, Reliance Communications, Telkom Indonesia, Globe Telecom, Sri Lanka Telecom
(4) Asia Pacific Developed operators include Telstra, NTT DoCoMo, Singtel, KT Corp., PCCW

Asian operators have however seen a reduction in their return on capital employed (ROCE) between 2008 and 2010 (see Figure 10), partly due to rising competitiveness in their markets which has dampened revenues and profits, and partly due to the large investments in network infrastructure that they have been making and which are expected to yield long-term rather than immediate returns. On the whole, developed market operators' ROCE remains lower than that of their emerging market peers, although the difference is not as great as it was in 2008. While most emerging market operators in our sample have seen a fall in ROCE, The Indian operator stands out as having seen the biggest decline, driven by a rising competitiveness in the Indian market that has reduced profitability and significant increases in the asset base due to heavy network investments. . Amongst the developed countries, the Korean operator stands out as the outperformer, having reversed its sliding profitability up to 2008 by posting earnings[vii] more than double that of 2008, driven by smartphone and data revenue growth. Despite the overall downwards trend, however, operators have managed to maintain the delivery of shareholder value through this difficult economic climate.

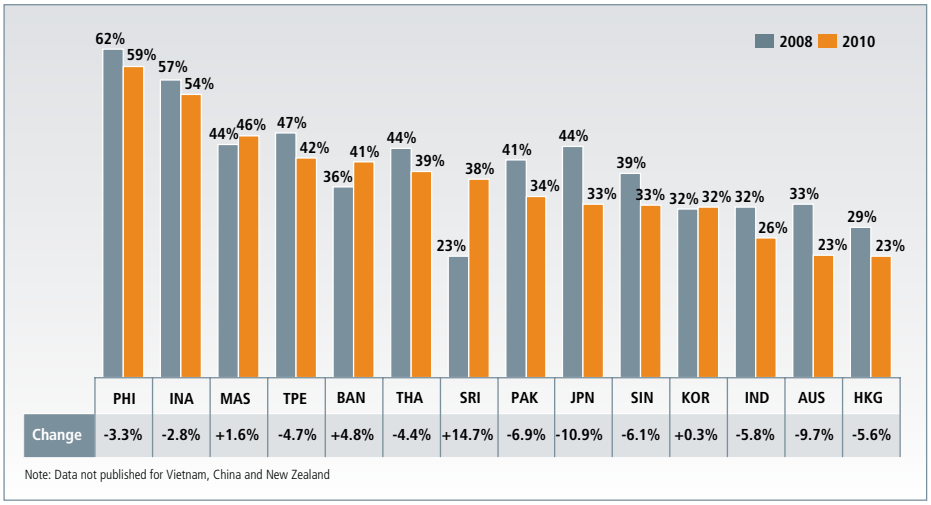
vii EBIT = Earnings before Interest and Tax

Figure 10: Return on Capital Employed, Selected AP17 Operators[15]



According to a report published by the OECD, the resilience of communication markets can be generally attributed to "long contract durations, the emergence of bundled offers, and the fact that communications services are increasingly perceived as a non-discretionary spending".[16] While the latter holds true in Asia Pacific – mobile is clearly emerging as a core part of people's lives across the region – the prevalence of prepaid connections and slow take-up of triple-play bundles is, however, likely to limit the impact of the other two factors in this region. The trend has been one of decreasing EBITDA margins in Asia Pacific in recent years (see Figure 11) – more than 70% of the sample size has shown a decline in their margins from 2008 to 2010. Operators in developed countries such as Australia and Japan have been the most impacted, compared to rest of AP17. Sri Lanka is the standout country that has seen its margins go from the lowest of the AP17 countries shown here in 2008 to a figure closer to that of its South Asian peers in Bangladesh and Pakistan. The dip in 2008 was largely driven by a price war amongst the operators, which drove average margins down. In 2010, operators recovered their margins through a combination of increased revenues and in the case of market leaders, Dialog and Mobitel (SLT), the implementation of successful cost management programmes.

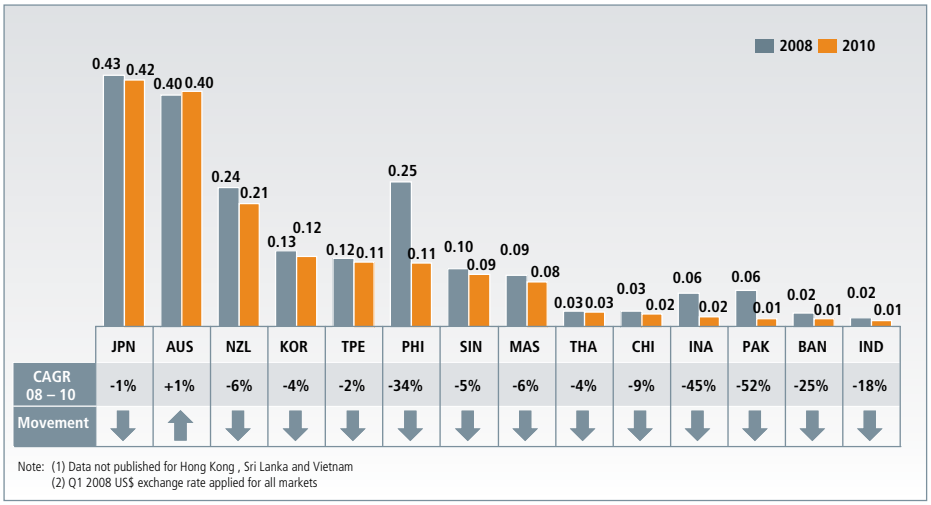
Figure 11: Average EBITDA Margins in Selected AP17 Countries[17]



Note: Data not published for Vietnam, China and New Zealand

This negative EBITDA trend is partly driven by a steady decline in average revenue per minute (ARPM) due to the aforementioned competitive pressures. ARPM in Asia Pacific has fallen significantly between 2008 and 2010 (see Figure 12), particularly in emerging markets. Most of these countries, such as India, Indonesia, Pakistan and Bangladesh, also have high competitive intensity as measured by the HHI Index, which has unmistakably contributed to price erosion. Indonesia, a market known for its multiple brands and tariff 'price wars' is amongst one of the cheapest mobile markets in Asia Pacific, following the price slash from US$0.20 per minute in 2006 to US$0.02 per minute in 2010 (a CAGR of minus 45%). These declines, while partly driven by reduced per-minute pricing as a result of increased competition, are also the result of increasing take-up of attractive bundled value plans such as free minutes. However, further drastic cuts due to aggressive competition could threaten to bring prices below economically sustainable thresholds, further impacting operator margins.

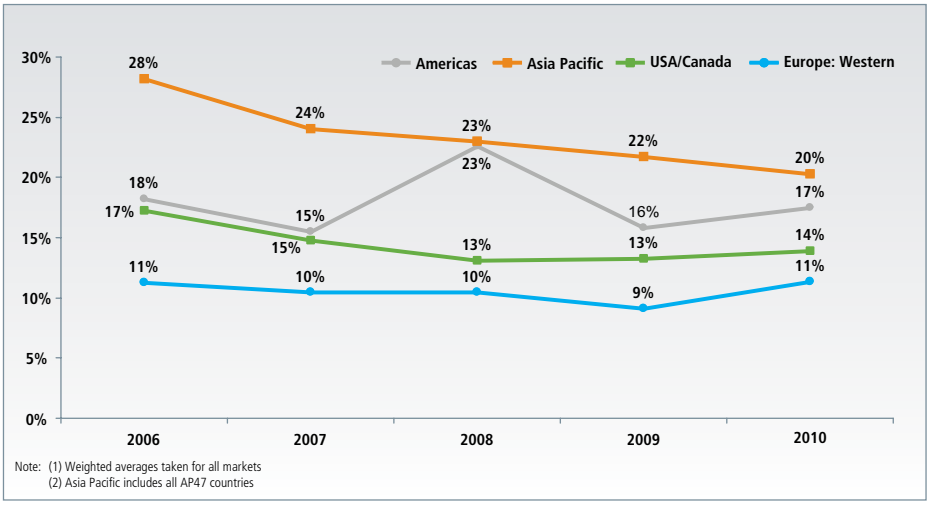
Figure 12: Average Effective Price Per Minute for Selected AP17 Markets[18] (in US$)



Note: (1) Data not published for Hong Kong , Sri Lanka and Vietnam
(2) Q1 2008 US$ exchange rate applied for all markets

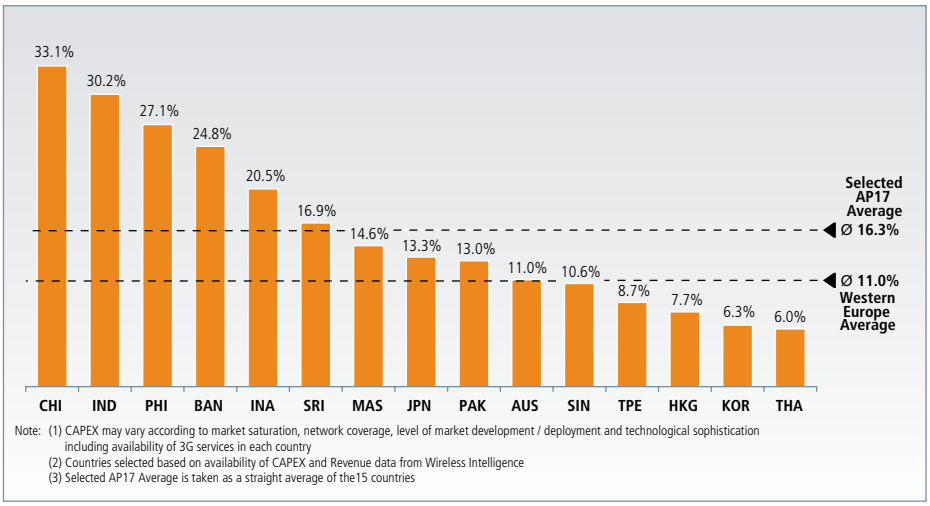
Asia Pacific operators have also been spending heavily on improving the breadth and quality of connectivity in their markets, particularly the developing AP17 markets where operators are spending a high proportion of their revenues (see Figure 13 and Figure 14). Since 2009, Chinese operators have invested over US$40 billion in 3G networks, installing nearly 700,000 base stations around the country.[19] Similarly in the Philippines, Globe Telecom is investing heavily in network upgrades while PLDT is enhancing its 10,000 kilometre domestic fibre-optic network.[20] Across the region operators are laying the groundwork for 4G, sometimes in tandem in an effort to reduce the pressure on their balance sheets. For example, in Hong Kong operators Hutchison Telecom and PCCW's Hong Kong Telecom have formed a joint venture to build their LTE network.[21] Nonetheless some aspects of the current situation indicate that it may not be sustainable in certain countries. For example, Figure 10, Figure 11, Figure 12 and Figure 14 indicate that Indian operators have the lowest tariffs, amongst the lowest EBITDA margins in AP17 and declining return on capital employed. Nevertheless, capex as a percentage of revenue is the second highest in AP17.

Figure 13: Global Mobile Operator CAPEX/Revenue Comparison, 2006 – 2010[22]



Note: (1) Weighted averages taken for all markets
(2) Asia Pacific includes all AP47 countries

Figure 14: CAPEX/Revenue Ratios in Selected AP17 Countries[23]



Note: (1) CAPEX may vary according to market saturation, network coverage, level of market development / deployment and technological sophistication including availability of 3G services in each country
(2) Countries selected based on availability of CAPEX and Revenue data from Wireless Intelligence
(3) Selected AP17 Average is taken as a straight average of the15 countries

Despite the pressures that they are facing, it is important that operators, as well as the other players in the mobile ecosystem such as leading device manufacturers, are able to maintain their levels of investment. As elaborated further in Chapter 4, the mobile sector has a significant positive impact on the economy as a whole in terms of job creation and productivity improvements, and will play a key role in leading slowing economies away from potential recession. As OECD notes, policy makers and regulators should encourage investment and competition at all levels of the various value chains across the communications industry . These investments will also help drive social benefits which will indirectly have a positive economic impact. This is examined in more detail in Chapter 5. Telecom regulators have the opportunity to be recognised for the positive role that they can play in ensuring that Asia Pacific weathers the global economic crisis and continues to act as the world's economic growth engine. These requirements are examined further in Chapter 6.

3. Mobile Broadband and Data Services

Key Messages:

Mobile broadband is booming across the Asia Pacific region, increasingly becoming the standard conduit to access the Internet – by 2015 Asia Pacific is expected to account for 40% of global data traffic

As mobile data usage rises and voice ARPM declines, non-SMS data as a percentage of revenues has risen to 19% in developed APAC markets and 11% in developing ones

The mobile broadband boom is driven by investment and innovation across the ecosystem, including mobile operators, data service providers, device makers, and support service companies – with Asia Pacific players making an impact on the global stage

M2M is a growth area in mobile data, with APAC connections expected to rise from 740 million in 2011 to over 5 billion in 2020

The inaugural Mobile Broadband Readiness Index (MBRI) shows how prepared APAC markets are to benefit from the economic and social benefits of mobile broadband. Countries that are successful in creating an ecosystem that is conducive to further growth in mobile data services have the potential to make rapid leaps ahead of their peers. Japan has risen to the top of the index, driven by its early 4G rollout and its pro-innovation environment. Hong Kong and Vietnam also jumped ahead, demonstrating their strong commitment to fostering a successful mobile broadband landscape.

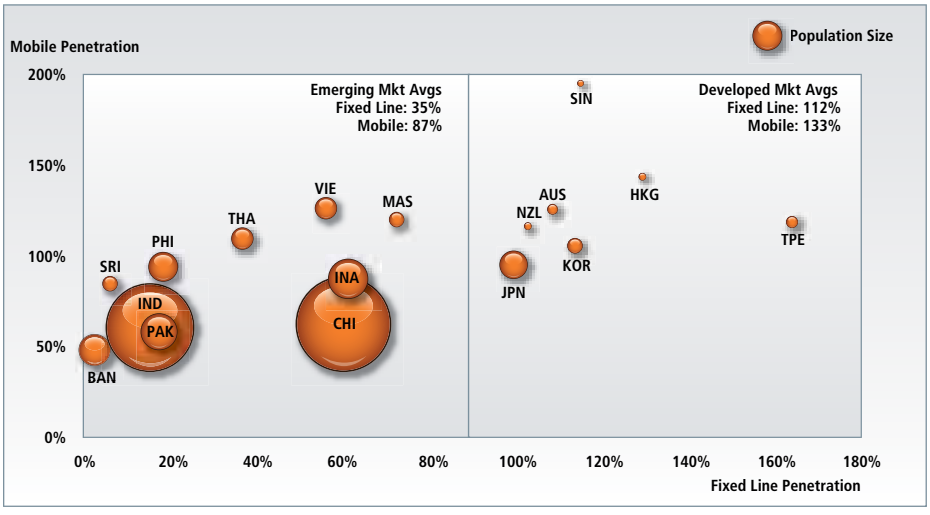
3.1 Mobile Broadband – Booming Across Asia Pacific

The 2009 Asia Pacific Mobile Observatory report highlighted that mobile is rapidly emerging as the primary channel for voice communication for the citizens of Asia Pacific, indeed often also the only channel. This remains particularly true in emerging markets, where the relatively low quality and limited coverage of the fixed line network has meant that mobile operators were rapidly able to offer superior quality at a competitive cost and thereby introduce a highly successful alternative to fixed line voice communication. In addition, customers can usually get a mobile connection set up much more quickly than a fixed-line one.

Figure 15 shows that, as of 2010, mobile penetration[viii] generally exceeded fixed line telephone penetration in Asia Pacific markets. The developed AP17 markets have, on the whole, shown an increase in both fixed line and mobile internet penetration rates from 2008, but higher average growth in fixed line penetration than in mobile internet penetration. Conversely, the developing AP17 countries have a higher mobile internet penetration growth rate relative to fixed line. The countries with the lowest fixed-line penetration rates such as Bangladesh, Pakistan and Sri Lanka share a similar trend of rapid increase of mobile connections, for example Sri Lanka and Bangladesh's mobile penetration rates both increased by a factor of over 1.5x between 2008 and 2010. The underlying drivers of this rapid growth are discussed throughout this chapter, but one decisive factor is the lack of alternatives forms of communication due to the limited reach of the fixed-line infrastructure.

In some cases the differences were extreme. For example in Bangladesh only 1 in 30 households had a fixed line in 2010, while mobile phone penetration stood at nearly 50%. Even after taking into consideration the fact that in some markets customers frequently carry more than one SIM card, the proportion of people connected to mobile networks far exceeds those connected to fixed networks.

Figure 15: Mobile vs. Fixed Line Penetration in AP17

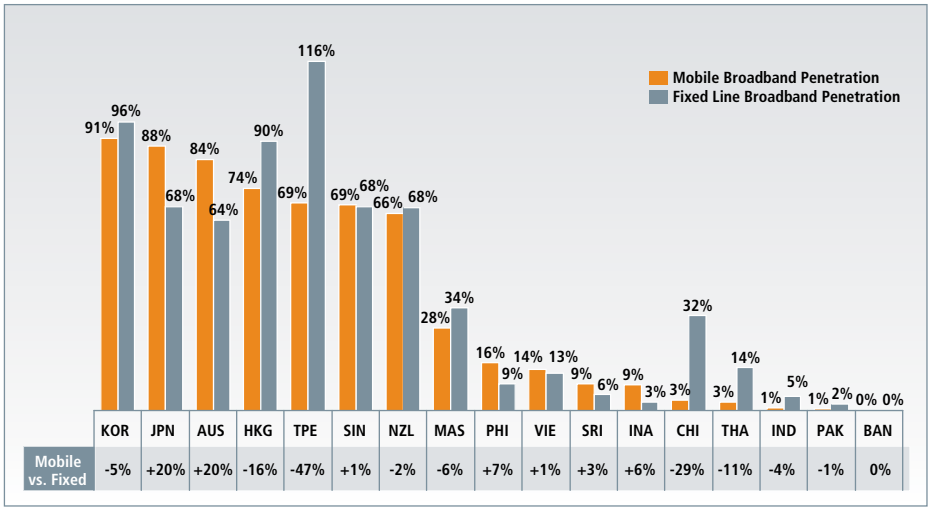


viii As measured by the number of SIM cards as a percentage of the population

The same trend is becoming evident in broadband[ix] access, driven largely by the same factors. The ITU reported in 2008 that global mobile broadband subscribers had exceeded fixed broadband subscribers for the first time[25] – with Asia Pacific leading the way. The net result is that, in many markets, mobile networks are already the default gateways used to connect to the Internet (see Figure 16). This is already the case in the Philippines and Indonesia. Indeed in emerging markets mobile will usually be the only Internet access channel. A recent study shows that in India nearly 60% of the connected population only accesses the Internet via mobile networks rather than via a fixed line connection, which is representative of many Asia Pacific emerging markets[26]. The uptake in mobile internet in these emerging markets has also largely been driven by handset affordability, relative to the cost of a fixed line connection.

Strikingly, in both developed countries, like Japan and Australia, and developing ones, such as the Philippines and Sri Lanka, mobile broadband penetration has already exceeded fixed line broadband penetration (see Figure 16). This challenges common belief that in developed markets with high-speed fixed line broadband connection mobile will usually be a complementary Internet access channel, and the default Internet access channel in the home will remain through a fixed connection.

Figure 16: Mobile vs. Fixed Line Broadband Penetration in AP17[27]

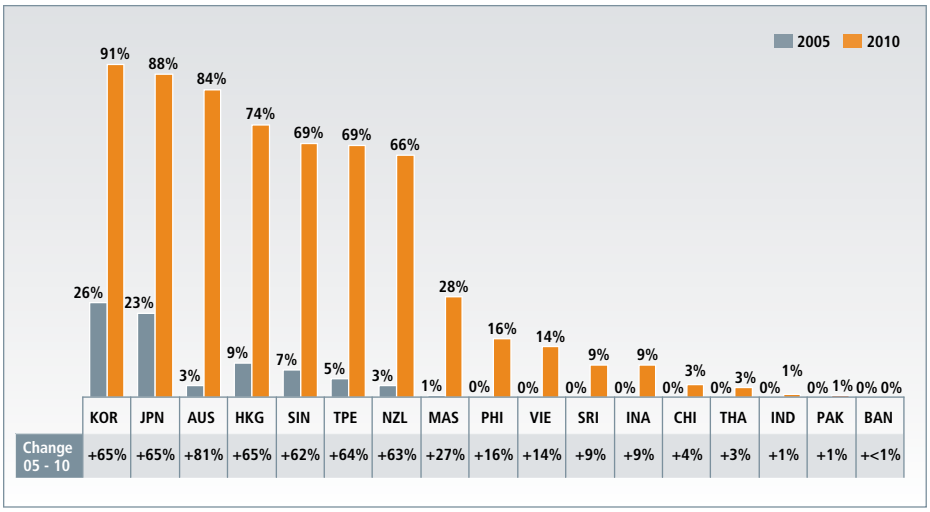


The rapid growth in mobile broadband connections across Asia Pacific over the past five years is shown in Figure 17. Korea's mobile broadband penetration has surged from just 26% in 2005 to 91% in 2010, while Japan, Hong Kong and Australia also stand at more than 70% penetration in 2010. Amongst emerging markets the growth has been equally dramatic. Malaysia and Philippines both had mobile broadband penetrations below 1% in 2002, which had risen to 28% and 16% respectively in 2010.

The net result will be a massive surge in the number of mobile Internet users. In China the number of mobile Internet users is projected to reach a phenomenal 957 million by 2014[28]. Even taking into account that a portion of these were already previously connected through a fixed line, this still translates to an enormous increase in the number of people who are enjoying the benefits of being online for the first time. Mobile is therefore proving to be the key lever for connecting the citizens of Asia Pacific to the rest of the world through the Internet.

ix Mobile Broadband is defined in this paper as mobile technologies that enable data download speeds greater than 1Mbps, such as W-CDMA / HSPA (HSDPA, HSUPA, HSPA+), CDMA2000 1x-EVDO (and Rev. A) and TD-SCDMA

Figure 17: Mobile Broadband Penetration 2005 vs. 2010[29]

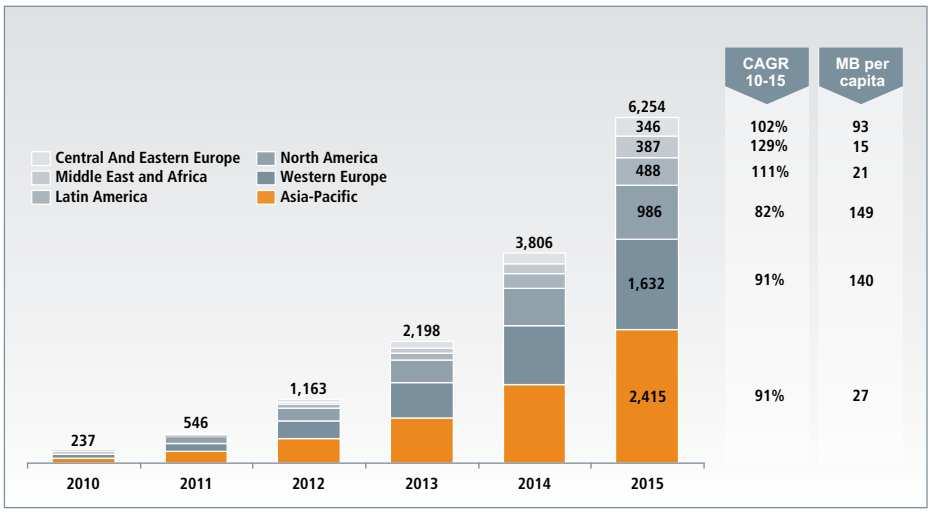


As the number of mobile Internet users grows across the region, so has the volume of data traffic passing through the network. In South Korea between mid-2009 and mid-2010 KT reported an increase in 3G mobile data traffic of nearly 350% while rival SK Telecom saw an increase of over 230%. In Japan Softbank saw a 260% increase in mobile data traffic between Q1 2009 and Q1 2010, while KDDI is projecting mobile data traffic to increase by a factor of 15 between 2010 and 2015. Emerging Asia Pacific markets are witnessing the same trend – China Unicom's 3G traffic rose 62% in three months alone between Q1 and Q2 2010.

This growth is propelling Asia Pacific to the forefront of global mobile data traffic consumption, as illustrated in Figure 18. In 2010 total mobile data traffic in Asia Pacific (excluding Japan) was approximately in line with that of North America at nearly 55 petabytes/month, although behind Western Europe. If you include Japan, Asia Pacific's data traffic was already 95 petabytes/month, which was double that of North America.

By 2015, four out of every ten petabytes of the world's mobile data traffic is estimated to pass through Asia Pacific networks – more than any other region. Japan will account for only 24% of this, down from 42% in 2010, as the large emerging markets in the region see a rapid increase in mobile broadband usage. On a per capita basis, however, Asia Pacific's mobile data traffic still lags well behind that of other regions, which suggests that there remains massive growth potential as the number of connected users increases.

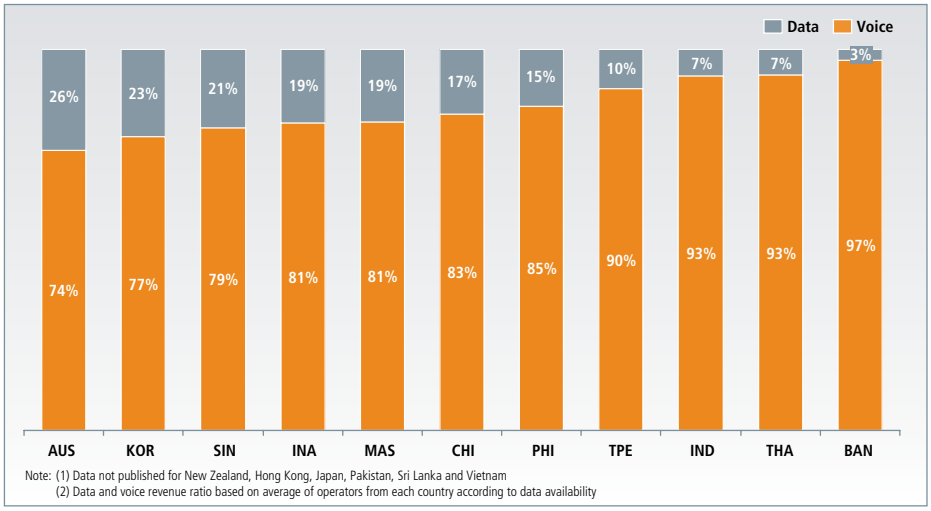
Figure 18: Global Mobile Data Traffic by Region and Per Capita[30]
(in '000 Petabytes per month)



Delivering this boom in data traffic represents a significant challenge, and opportunity, for Asia Pacific's mobile operators. As intense competition and saturation on voice starts to drive down margins, many operators have been looking to mobile data for the next wave of revenue growth. As early as August 2009, the CEO of Malaysia's third player DiGi, Johan Dennelind, highlighted where their future focus would be by stating, "Our key positionings are around 3G and Internet services". Similarly, when E-Mobile entered the crowded Japanese market in 2007 it based its market positioning around the provision of mobile broadband data services, before only later moving into the voice market[31].

Data and VAS revenues comprise a growing share of total service revenues for mobile operators, as shown in Figure 19, although there remains a wide variation between countries and operators. For example, Australia's data revenues (excluding SMS) are at more than a quarter of total. Conversely, Bangladesh at the other end of the scale is a much more voice-focused market, with just 3% of revenues coming from data services. Similarly, in China, a recent Nielsen survey shows that only a slight majority of mobile consumers (54%) used their devices for non-SMS data such as e-mail, gaming and music, while over a third used their phones for SMS and voice only. The remaining 10% used their phones for calls only[32].

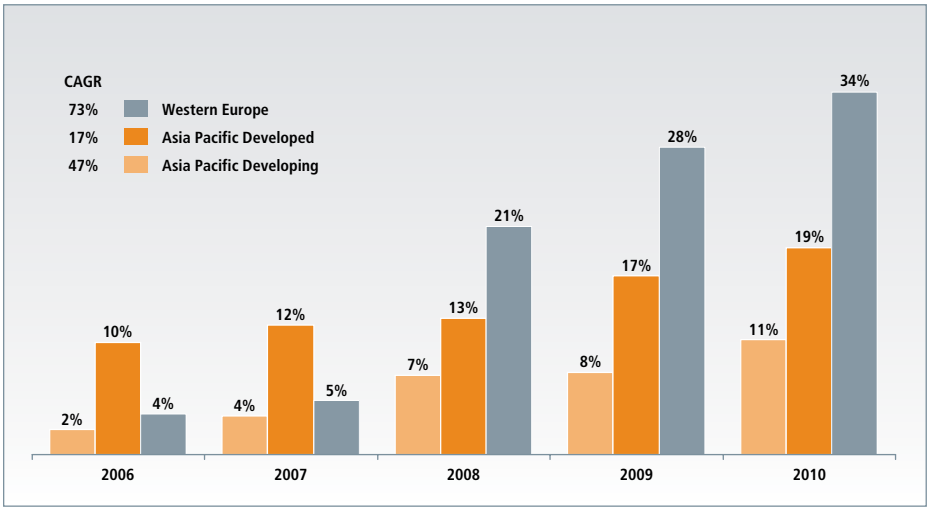
Figure 19: Data (excl. SMS) vs. Voice Revenues for Selected AP17 Countries[33]



Note: (1) Data not published for New Zealand, Hong Kong, Japan, Pakistan, Sri Lanka and Vietnam
(2) Data and voice revenue ratio based on average of operators from each country according to data availability

At a regional level, Asia Pacific's developed and developing markets have both seen rapid growth rates in the proportion or revenues coming from data services, albeit still behind their European counterparts (see Figure 20). This is testament to the 3G network rollout and in the data service innovation by the leading operators, as well as innovation in devices and supporting platforms by other equipment and device vendors in the broader mobile ecosystem, although it does also reflect the above-mentioned rapid decline in ARPM.

Figure 20: Data Revenues as a Percentage of Total, by Region[34]

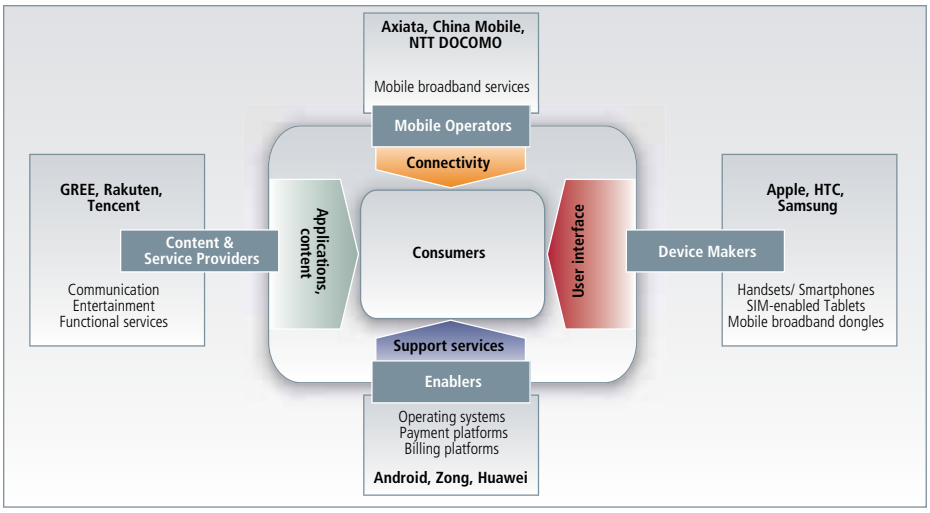


3.2 Investment and Innovation across the Mobile Data Ecosystem

The growth in mobile data is driven by investment and innovation by players across the entire mobile ecosystem. This includes:

- Mobile operators providing connectivity and data services
- Content and service providers providing applications and content
- Device manufacturers providing mobile broadband-ready handsets
- Enablers providing the required support services

Figure 21: The Mobile Data Ecosystem[35]

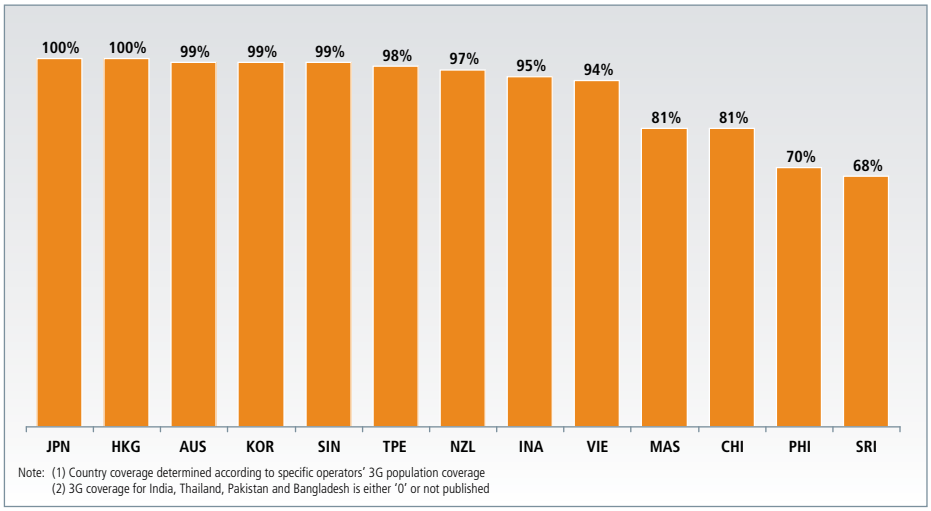


3.2.1. Connectivity

Mobile operators are playing a key role in driving the growth in mobile data in three ways: by rolling out 3G networks to increase the population coverage; by providing access speeds that maximise the quality of the user experience; and by offering data tariffs and packages that are affordable enough to ensure mass adoption.

The proportion of the population covered by 3G networks has grown rapidly in recent years. In all developed Asian markets coverage now stands at >95% (see Figure 22), while the likes of Malaysia and Indonesia have also achieved population coverage of over 80% - especially impressive given the topography of these countries. Continued strong growth in 3G coverage is expected. For example, at least 80% of China's population is already covered by a 3G signal, and China Mobile has been aggressively pushing their rural expansion strategy[36]. The mobile operators' willingness and capability to expand their existing 3G networks and invest in new ones will be key to ensuring that sections of society living in lower-density population regions are not "left behind".

Figure 22: 3G Network Population Coverage for Selected AP17 Countries[37]



Note: (1) Country coverage determined according to specific operators' 3G population coverage
(2) 3G coverage for India, Thailand, Pakistan and Bangladesh is either '0' or not published

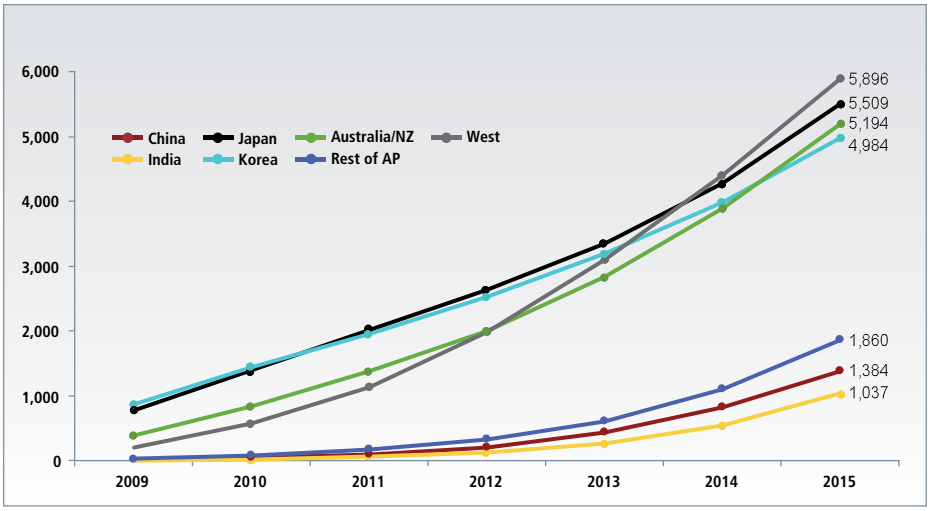
The Asia Pacific region has been at the forefront of the drive towards 4G network ever since NTT DOCOMO first proposed the LTE format in 2004. After CSL's launch in Hong Kong in November 2010, the Japanese carrier launched its LTE service in December, and is investing US$3.7bn to achieve 70% population coverage in Japan by 2015. Other developed Asia Pacific markets have also been early global adopters of LTE through 2011, with Singapore's M1 going live with South East Asia's first LTE service in June, and SK Telecom following suit in South Korea in July and Telstra launching its service in Australia in September.[38]

Emerging Asia Pacific markets are also showing a strong commitment to 4G. Indeed, the GSMA estimates that of the forecasted 126 million LTE subscribers in the Asia Pacific region in 2015, half will be in China. China Mobile is targeting 60 trial networks and 20 commercial networks by the end of 2012 and in February 2011 teamed up with Japan's Softbank, India's Bharti AirTel and four European and US operators to drive the global adoption of the TD-LTE standard. In Sri Lanka both Mobitel and Dialog announced LTE testing in 2011, in Malaysia Maxis started LTE testing in 2010 and in the Philippines both Smart Communications and Globe Telecom launched 4G mobile services in April 2011.

Beyond simply rolling out new networks, operators are playing a key role in ensuring that fast access speeds are actually also experienced by their customers. 4G networks will offer theoretical download speeds of up to 100 Mbps – thereby significantly improving the user experience and expanding the range of applications that can be used, such as high-definition video calling. This in turn is driving exponential growth in demand for data services as well as greater mobile broadband substitution from fixed broadband.

Average connection speeds realised in Japan and South Korea are already the highest in the world (see Figure 23), with average speeds of 1,400 kbps in 2010 – nearly three times higher than a "Western" average[x]. While China and India lag well behind, with average access speeds of only 50 kbps and 19 kpbs, respectively, these speeds are projected to grow at nearly 100% in both countries and cross the 1,000 kbps mark by 2015. China and India will therefore be positioned to experience the same boom in mobile data consumption that we are currently seeing in Japan and Korea.

Figure 23: Mobile Broadband Connection Speeds in Asia Pacific[39] (in kbps)



As well as providing the network coverage and access speeds, operators' data pricing has been a key factor in the adoption rate of mobile data services, particularly in emerging countries where customers have lower disposable incomes. The prevalence of unlimited data tariffs for heavy-usage customers has, together with faster access speeds, led to increasing mobile substitution of fixed line Internet access.

In Indonesia, leading operators, Telkomsel, Indosat and XL offer unlimited prepaid data packages on a monthly basis, providing their customers with greater flexibility both in terms of payment, and usage period. XL, offers both daily and monthly unlimited data packages – daily packages are priced at IDR5,000 (~US$0.60) and monthly prepaid data packages start at IDR49,000 (~US$5.50)[40]. BlackBerry users are also eligible for subscription to unlimited data roaming for when they travel to any of XL's partner countries. Telkomsel has since launched data packages to compete with XL by offering a similar roaming package, which offers unlimited BlackBerry roaming on a flat rate. Tariff innovation has also helped to provide customers with flexibility in their data consumption. For example in September 2011 Starhub launched Singapore's first postpaid plan that allowed for sharing of data bundled data between family members.

Operators have also encouraged adoption and usage of mobile data amongst lower-end, more price-conscious customers by offering affordable, bite-sized data tariffs. In the Philippines a 30 day volume-based data plan starts at only PHP99 (~US$2.50) for 50MB, while consumers can also purchase 25MB of data for just PHP20 (~US$0.50). In addition, unlimited data roaming agreements have encouraged higher mobile data consumption when travelling. This is discussed in more detail in Chapter 6.

Historically, operators have rolled out new high-cost 4G networks while simultaneously offering increasingly affordable data tariffs, as a means of encouraging new subscriber acquisition and service adoption. As the market develops, operators are faced with new challenges. For example, for one Malaysian operator 85% of its network capacity is consumed by its mobile broadband service, which accounts for only 20% of its revenues. Faster mobile Internet access speeds will lead to increased usage of over-the-top services, in

x Average of US, UK, France, Germany, Italy

particular VoIP and video-calling, the latter increasingly in high-definition. Cisco estimates that by 2015 two-thirds of the world's mobile traffic will be video[41]. These services will directly compete with the voice services that account for the large majority of operator revenues, thereby impacting their revenues. As mobile data usage becomes a mass market trend across Asia these issues will become increasingly pressing for mobile operators.

In some markets operators have responded by scrapping their unlimited data plans or introducing fair-usage policies. Other operators have introduced network management tools to manage bandwidth for the heaviest users that account for a disproportionate share of traffic and increase the amount of traffic that they can deliver over their networks without reducing service quality. This is especially the trend in developed markets with high 3G coverage and smartphone penetration. After the likes of AT&T in the US and O2 in the UK, M1 in Singapore announced in August 2011 that, like market leader SingTel, it would no longer be offering unlimited data plans[42]. This will effectively lead to a price increase for high-usage customers. Furthermore, in some developed markets operators have explicitly increased data prices for all customers, such as Verizon, Sprint and Virgin Mobile in the US in 2011[43]. It may be only a matter of time before Asian operators are in a position where they will follow this trend.

3.2.2. Applications and Content

Innovation around the development of mobile-based services has been a key factor in driving mobile data usage. These services can be broadly defined in three categories:

- Communication: e.g. VoIP, instant messaging, email, video-calling
- Entertainment: e.g. gaming, video-on-demand, mobile TV, music-on-demand
- Functional services: e.g. m-commerce, payments, bookings, location-based services

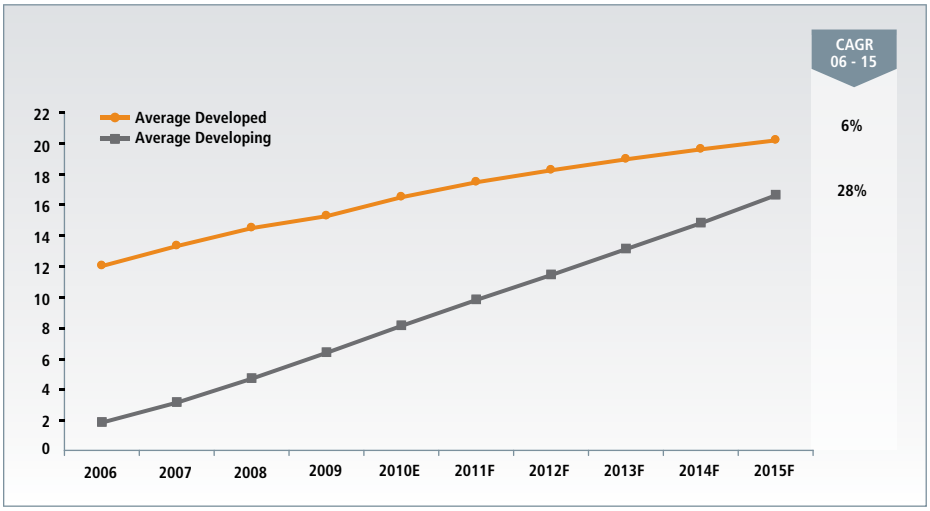
Communication. Asia Pacific's mobile users, like their counterparts in other geographies, increasingly have a wide range of communication tools available to them beyond simple voice calls. Beyond the communication services imported from Europe and the US, such as Skype and Yahoo! Messenger, Asia Pacific companies are providing innovative over-the-top mobile-based communication solutions.

Tencent, China's biggest Internet company, has partnered with Taiwanese handset maker HTC to embed its QQ instant messaging (IM) system into HTC's smartphones[44]. As well as the IM service, Tencent will provide users with online storage, a browser interface and microblogging services. Fellow Chinese Internet behemoths Alibaba and Baidu have mooted similar ventures in partnership with handset manufacturers.

Some mobile operators are responding by providing their own services in this category. For example Singapore's StarHub has launched its own converged, device-agnostic mobile communications service called pfingo, built around a VoIP platform and complemented it with email and messaging services. It offers a Singapore VoIP number and free calls between users for between S$2 and S$13 per month[45], in response to the competitive landscape.

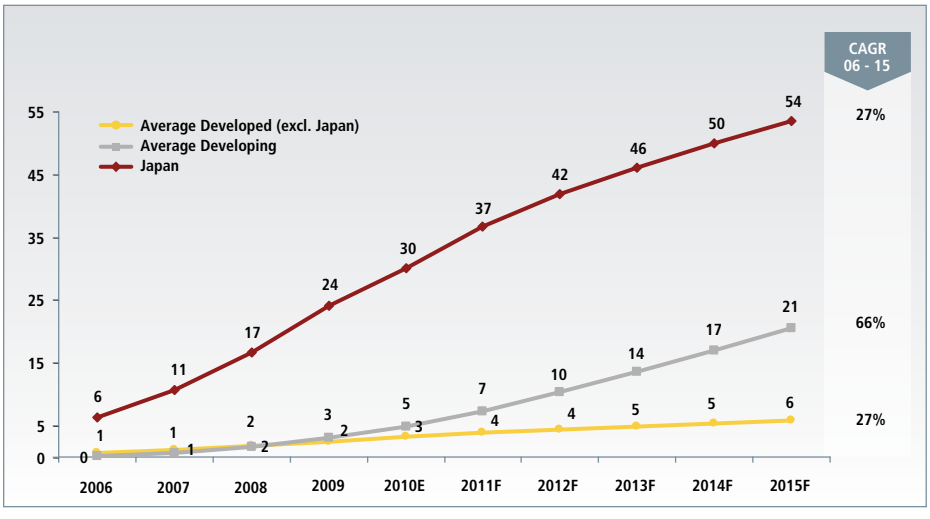
As well as mobile VoIP and instant messaging, mobile email usage has been growing rapidly across the region, with a projected average annual growth rate of 6% between 2006 and 2015 for developed Asian markets and 28% for developing ones (see Figure 24). Japan leads the way, already with approximately 100 million users in 2010[46]. The importance of being able to communicate by email, anytime and anywhere, with work or social groups, will continue to drive the rapid adoption of mobile email.

Figure 24: Mobile email user growth in Asia Pacific[47] (in millions)



Entertainment. Asia Pacific is amongst the world-leaders when it comes to innovative mobile entertainment services. Mobile video is one especially fast-growing area, as connection speeds continue to rise together with smartphone penetration. The projected average annual growth rate is 27% between 2006 and 2015 for developed Asian markets and 66% for developing markets (see Figure 25). Japan had an estimated 30 million mobile video users in 2010, projected to rise to over 50 million by 2015. This will have a major impact on data traffic, given the bandwidth-hungry nature of mobile video streaming, especially as high-definition video takes off.

Figure 25: Mobile Video Users in Asia Pacific[48] (in millions)



Mobile gaming is well established in Asia Pacific, with Japan and South Korea the leading innovators in this segment. In Japan GREE, the largest social networking site, is heavily focused on gaming and now receives 90% of its traffic from mobile users, which number 140 million in total[49]. In 2011 GREE announced its intention to expand into South Korea, Singapore, the UK, The Netherlands and Brazil. In the meantime its main rival, DeNA, has partnered with Namco Bandai Games to produce and deliver social games to smartphone customers both inside and outside of Japan. Korean game producer Gamevil provides games through KT, SK Telecom and LG Telecom, and since its founding in 2000 has successfully undertaken an initial public offering and launched its games in the US through the major mobile operators[50]. These two examples demonstrate the ability of Asia Pacific's mobile data

service providers to not only import innovation from the likes of Apple and Google, but also export it to the rest of the world.

In mobile video, Nico Nico Douga, a Japanese video-sharing site, launched its mobile version in 2007 and had amassed nearly 6 million active mobile users by the end of 2010, of which 96% are in Japan. Revenues in 2010 (including fixed line Internet) stood at US$60m, mainly driven by premium memberships and advertising. In India, Hungama, South Asia's biggest digital entertainment company, has partnered with Korean DRM technology provider INKA Network in 2010 to deliver Bollywood movies and TV series to 250 different kinds of mobile devices, ensuring maximum coverage.

Many operators are launching their own mobile data entertainment services to capture a share of the market and try to increase customer stickiness. In 2011 NTT DOCOMO partnered with social gaming website Mobage to connect its i-mode mobile web portal to Mobage's gaming portal. DiGi in Malaysia has launched a mobile music service, DiGi Music Unlimited, targeted at the youth segment and built around music social networking. DiGi offers free mobile browsing to and downloads from the site, with users paying when they share playlists or tracks.

Functional services. As well as providing mobile users with new communication options and entertainment channels, a data-enabled mobile handset also allows users to perform everyday functional and transactional activities that would normally be performed through other channels. Asia Pacific has been at the forefront of innovation for many such services.

Mobile payments is a well-established genre, but one that continues to breed innovation, especially in the field of m-commerce. In 2011 China's e-commerce giant Alibaba launched its mobile wallet solution, where users first deposit funds in an AliPay account and/or link their bank cards to the system, and then can use their mobile phones to make in-store payments without charges. AliPay produces a mobile barcode, which can then be scanned by merchants using the in-built camera on their own AliPay-enable handset, or using their standard scanning gun[51]. The fact that there are now 550 million users[52] at the end of 2010 is testament to the success of the system and has helped to drive Alibaba's expansion from fixed-line to mobile e-commerce.

Mobile operator China Telecom has responded by partnering with China UnionPay to offer a money transfer and bill payment platform. Users with compatible SIMs are able to then use their handsets as payment terminals, using a top-up virtual currency account or bank cards linked to the special SIM card. China Telecom has the advantage over non-operators of being able to integrate this with their customer billing platform for ease of payment.

Japan's leading e-commerce player, Rakuten, is increasing its focus on m-commerce, acknowledging it as a key growth area[53]. Rakuten is now applying its expertise in e- and m-commerce on a global basis, since 2010 spending nearly US$40 million to acquire the UK's Play.com[54], rated as the best 2010 UK mobile commerce site[55], Russia's ozon.ru, which has a dedicated English and Russian language iTunes application, and the US's buy.com whose m-commerce platform features barcode scanning and voice recognition.

The provision of location-based services is another emerging area in mobile data services. In China, Nokia has partnered with leading ISPs Tencent and Sina to integrate Chinese location-based services to its Ovi Maps application. Users can share their location services with their friends and families via Sina and Tencent's respective online social network communities.

The overall picture is one of migration and new channel stimulation. Voice communication is being shifted and complemented with mobile VoIP, video-calling, email or chat. Consumption of offline entertainment channels such as TV and radio is being migrated and even stimulated further through mobile-based gaming, video or music. Traditional functional activities such as credit card or cash payments are finding new market segments by being pushed to new channels through the adoption of mobile payments and m-commerce. These dynamics in mobile data services are at the centre of an ongoing trend that is changing the profile of the mobile ecosystem, and arguably shifting the balance of power away from established players towards new entrants, content and service providers.

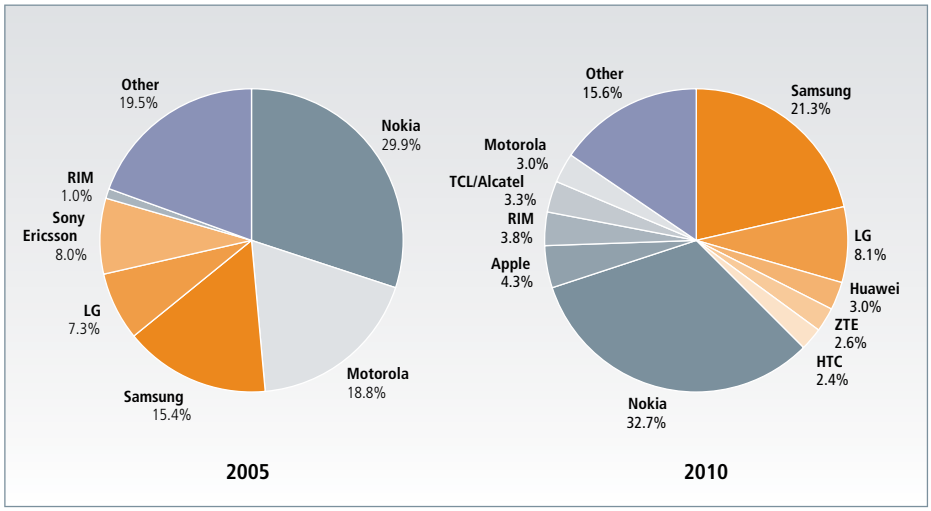
SingTel Innov8

Recognising the benefits of innovation across the mobile ecosystem, some operators are taking a proactive approach by identifying, funding and co-developing new mobile technologies and services in partnership with SMEs and entrepreneurs. SingTel has been a pioneer in this area, setting up its Innov8 venture capital fund in 2010 to identify and invest in small firms with innovative technologies. As of October 2011 Innov8 had ten portfolio companies based in Singapore, China and the US, with investments right across the ecosystem, including in mobile payment, social media and energy management solutions for data centres.69 This kind of model can be successful in giving operators such as SingTel access to innovative technologies, while in turn providing the early-stage companies with financing, market access and brand credibility from association with SingTel.

3.2.3. User Interfaces

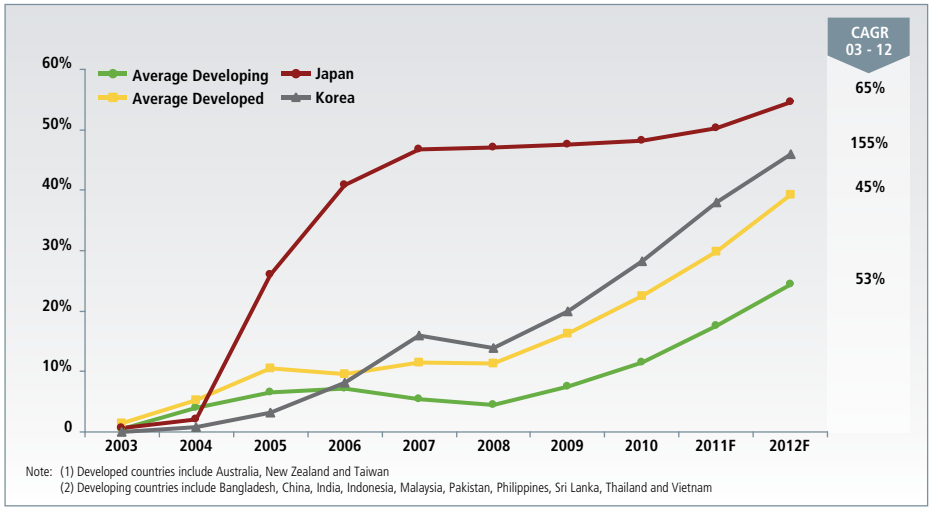
Asia Pacific device manufacturers are well-established as global innovation leaders and already command a significant share of the global smartphone market (see Figure 26), with Korea, Taiwan and increasingly China leading the way. Together, Samsung, LG, HTC, Huawei and ZTE had a 37% market share at the end of 2010. The Korean manufacturers have grown especially rapidly, with a combined sales market share in 2010 of nearly 30%, compared to 23% in 2005. Their transition from low-end to leading-edge is remarkable. More recently they have also emerged as credible global players in the fast-growing tablet computer market, with Samsung's Galaxy Tab emerging as arguably the primary challenger to Apple's dominance of that segment.

Figure 26: Global Smartphone Manufacturer Share of Sales[56]



As the availability, affordability and desirability of smartphones has increased, smartphone penetration in Asia Pacific has surged. In 2005 only 7.5% of handsets were smartphones (see Figure 27); by 2010 this had increased to 14.5%]. The region's leaders in terms of smartphone penetration are Japan and Korea with projected smartphone penetrations of 55% and 45% by 2012, respectively.

Figure 27: Smartphone Penetration in AP17[57]



The most recent Asian smartphone manufacturer making waves is Huawei, which in August 2011 announced that it would be launching a range of low-cost Android-powered smartphones priced as low as US$100. Huawei will take advantage of its strong existing presence in the sector, and close relationships with mobile operators through its network infrastructure business, together with its experience in providing "white-label" phones to other brands over several years. The handset will have all the specifications that are expected of higher-price smartphones – including a touch-screen interface, in-built camera, SD memory slot and Wi-Fi connectivity. Huawei's new smartphone is expected to make smartphone ownership, and therefore the full suite of mobile data services, accessible to millions of additional low-income customers across not only Asia Pacific but also Africa and other emerging regions.

3.2.4. Support Services

Aside from network connectivity, the availability of data services and smartphone penetration, the final element required to support mass growth in mobile data is the enabling platforms, in particular:

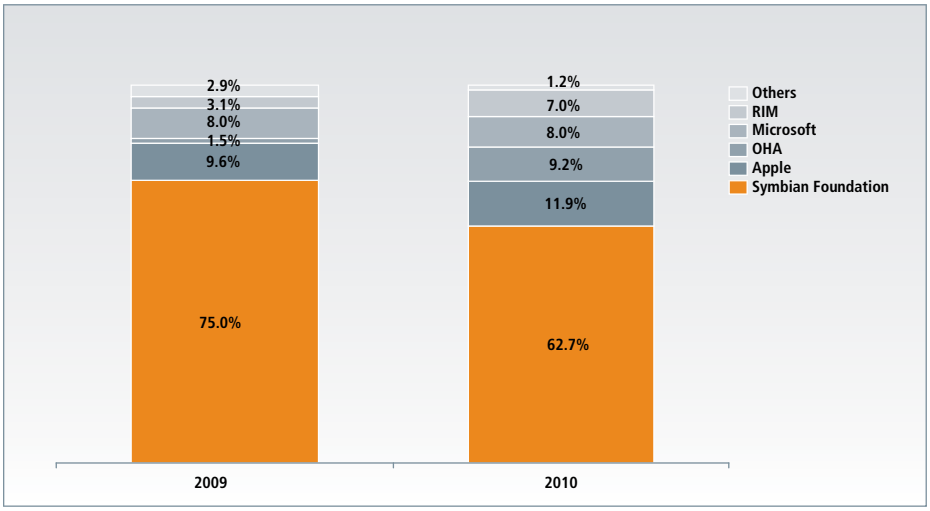
- Smartphone operating systems
- Payment platforms
- Billing platforms

Operating systems. Although mobile operating system innovation remains led out of the US, Asia Pacific is proving to be a premier battleground for mobile operating system ("OS") dominance. Google's Android OS is emerging as the preferred operating systems for smartphones manufactured by the leading Asia Pacific device manufacturers. This includes Samsung, LG, HTC and Huawei, with its new $100 smartphone. Between 2009 and 2010 Android's share of the Asia Pacific handset market jumped from 1.5% to 9.2% (see Figure 28). The latest 2011 figures show that Android now has a 48% global operating system market share in new handsets, but that this was much higher in many Asia Pacific markets. For example in South Korea, home of Samsung and LG, Android had 85% of the market while in Taiwan, home of HTC, they had a 71% share[58]. These markets will become even more competitive as Samsung and HTC both launch their own proprietary operating systems. The market share of Nokia's Symbian operating system remains the largest, but is also likely to be the one that sees the fastest erosion given the intense competition from all sides.

Google's has been pushing Android hard in Asia Pacific, especially in India and China, while working closely with local Asian partners. For example, Google is cooperating with the likes of Huawei and LG to lower the cost of smartphones, and has also brought Taiwanese low-cost chip maker MediaTek into the Open Handset Alliance (OHA) group that promotes the Android operating system. Google is also looking at ways to enable application developers to earn more money from their creations.[59] Ovum estimates that in 2011 Android will become the leader in application downloads by Asia Pacific consumers, at 1.8 million to Apple's 1.5 million, and that by 2016 Android will have nearly twice Apple's download share, at 6.1 billion compared to Apple's 3.4 billion[60].

While Apple is likely to continue to dominate the high-end of the Asia Pacific market in countries such as Singapore, the combination of low-cost Android smartphones and its expansion in terms of the size of its app store and the number of local apps will make mobile data services accessible to the masses and play a key driving role in mobile data growth.

Figure 28: Operating System Market Share in Asia Pacific[61]



Payment platforms. The rise of mobile payments across Asia Pacific requires integrated payment platforms to be developed. There have been different models to launch these platforms.

For example in the Philippines, one of the world's leaders in mobile payments, the two main players have each developed their own platforms to go with their services. Globe Telecom's GCash and PLDT's Smart Money currently each operate as separate mobile payment systems, which effectively means two currencies without the ability to exchange them. Operators developing independent mobile payment platforms has very much been the norm up to now; the inefficiencies of this set-up are however, recognised. In the Philippines Globe recently suggested that GCash and Smart Money will eventually need to interconnect to eliminate the inefficiencies of the current set-up.[62]

In Singapore it is the Infocomm Development Authority, rather than the operators, that has taken the lead in developing a common NFC mobile payment platform to be launched in 2012[63]. This platform connects the mobile operators, banks and payment providers in such a way that it is completely operator-neutral, and the IDA has also taken the lead in rolling out payment terminals across the country and establishing common standards.

As well as the country-specific mobile payment platforms, the growth of global web-based mobile payment platforms is impacting many Asian markets. For example eBay's Zong, which is connected to PayPal and specialises in social media payments, already has relationships with over 240 mobile operators globally[64] and a customer list that includes the likes of Facebook, Zynga and Chinese online games company Shanda Games[65]. In Asia Pacific they are already present in Australia, Hong Kong, India, Indonesia, South Korea, Malaysia, Philippines, Singapore and Taiwan, and integrated with the mobile operators in those countries, thereby offering customers the convenience of charging payments directly to their mobile phone bills. The spread of this type of universal mobile payment service will encourage further adoption of mobile social entertainment services, as well as accelerate the shift from desktop to mobile data consumption.

Billing platforms. Mobile operators have a key role to play in the provision of billing services that facilitate the back-end payment processing and invoicing on a customer's mobile phone bill. This needs to cover payments made through their own mobile payment platforms and a range of third-party payment systems, such as Zong (as described above). There is a need to provide efficient, easy-to-use and secure payments that are fully integrated with the operator billing systems for a variety of mobile applications, from app stores and e-commerce sites to NFC payment platforms and social networking site micro-payments. In addition, operators that launch M2M services will need to reconfigure their billing systems to handle the new requirements of the M2M business model.

KT in South Korea replaced their billing systems in 2011 explicitly to improve their ability to handle 4G convergent services and multiple payment options[66]. Indonesia's market leader Telkomsel also launched a new convergent billing platform in 2011, using Huawei's OCS (Online Charging System) platform, with the goal of facilitating customers payments for content, games and applications[67]. China Mobile has also implemented OCS to take advantage of the opportunities presented by China's growing 3G customer base. In Huawei's words, "setting up a real-time and convergent billing system is the key to profiting from the 3G trend".[68]

Asian vendors have been making tremendous progress challenging the established billing systems vendors like Amdocs, Ericsson and NSN. Several Chinese vendors have invested heavily to develop new integrated convergent solutions that have a clear roadmap backed with solid delivery capabilities and excellent, global references. For example, while Huawei is perhaps best known as a network equipment vendor, its Online Charging System/Convergent Billing System (OCS/CBS) is now used by more than 80 operators in 45 countries generating over US$1.2 billion in revenues.

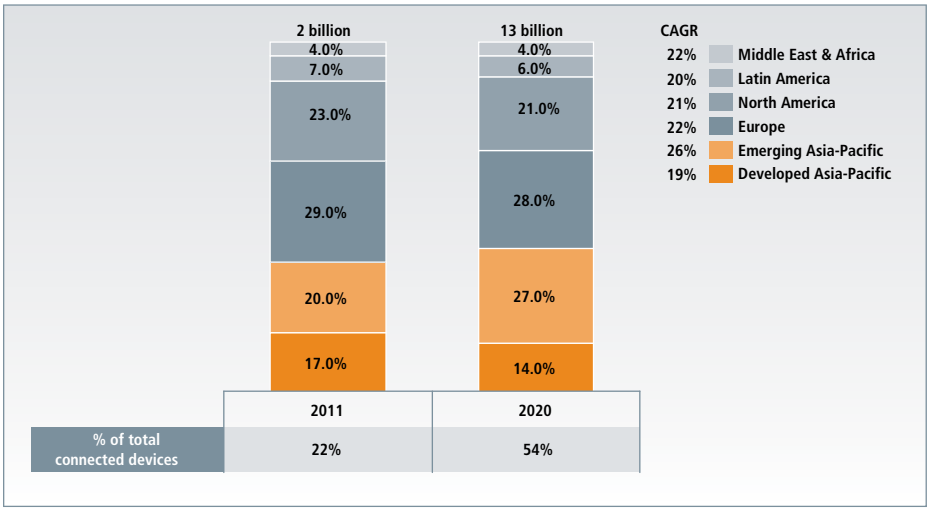
Asian vendors have played a significant role in furthering the scalability, flexibility and compatibility of operators' billing systems. The implementation of these systems have, in turn, helped drive mass adoption of paid-for mobile services by providing customers with the security and confidence to make these mobile payment transactions. Going forward, the growing breadth and complexity of mobile data services will only increase, and the operators' ability to select and deploy the right solutions will continue to play a key role in the growth in mobile data traffic.

3.3 Growth in M2M Data Services

One of the key emerging topics in mobile data is the rise of demand for machine-to-machine ("M2M") services. M2M is often referred to as the "Internet of Things", and relates to the communication of data without human involvement. This communication can be between machines, devices or any other item with an embedded SIM card. The data exchange passes over the mobile network in the same way as any other mobile traffic.

Global M2M connections will reach 2 billion by the end of 2011 and 13 billion by 2020, representing more than half of the world's connected devices (see Figure 29). Asia Pacific will be the core driver of this growth – connections in 2011 already account for 37% of the world total at 740 million, and will hit approximately 5.3 billion by 2020, or 41% of the total and well ahead of any other region. Most of this growth will come from emerging Asian markets which alone will have approximately as many connections as Europe by 2020. Of the total 13 billion connections in 2020, 2.3 billion are expected to be cellular. This growth will place significant additional demand on mobile networks, with Cisco expecting M2M to account for 5% of total global mobile data traffic by 2015.[70]

Figure 29: Global M2M Connections with Regional Breakdown[71]



The major M2M opportunities are in:

- **Automotive.** Embedding a mobile SIM can provide opportunities in remote performance and issue monitoring, as well as location-based fleet management services for logistics companies.
- **City management including buildings and infrastructure.** M2M services include remote monitoring for maintenance and service planning, traffic management and security (especially video surveillance). Of the 102 smart city projects currently underway, 21 are in Asia Pacific[72].
- **Healthcare.** Remote patient monitoring and treatment has considerable social and economic potential benefits. The GSMA predicts US$175-200 billion cost savings annually for managing chronic diseases in OECD and BRIC countries alone[73] IBM has already identified China as a significant market in this area.[74]
- **Home.** There is potential for a wide range of M2M-powered consumer benefits, including home security, integration of consumer electronics and location-based services for household members.
- **Utilities.** Smart grids and smart meters are one of the earliest M2M developments, providing remote consumption monitoring and control, leading to better planning, reduced outages and better environment management. The Chinese government has committed an initial US$7.3 billion to smart grids, while the figure for South Korea is even higher at US$23.7 billion by 2030.[75]

GSMA's Embedded Mobile Initiative[76]

The GSMA Embedded Mobile initiative is a market development programme designed to accelerate the adoption of wireless connectivity in a wide range of devices. It focuses on four key vertical sectors: consumer electronics, healthcare, automotive and utilities.

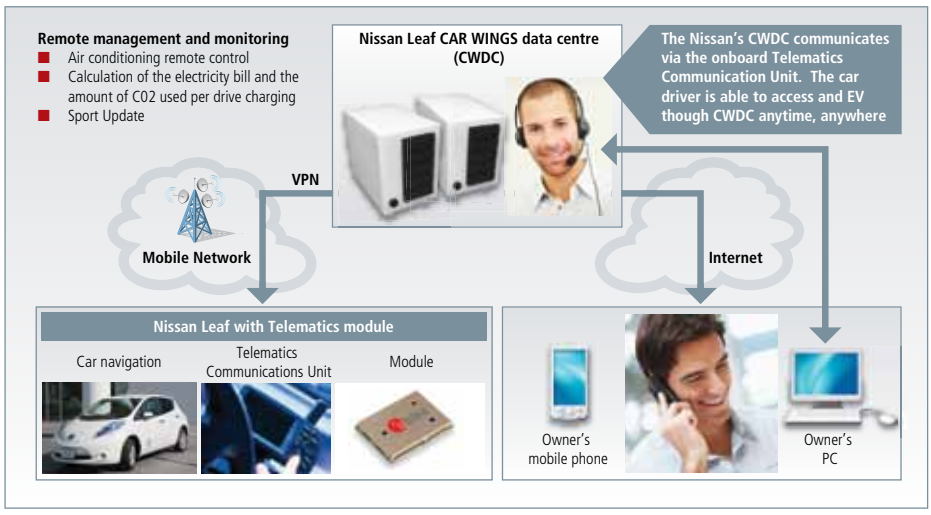
The goal is to drive a set of key market enablers across these verticals to support growth and innovation and overcome the current obstacles to market growth in M2M, namely by establishing common certifications and guidelines, developing policies, improving provisioning and addressing issues in roaming, fraud and security. The ambition is 500 million connected mobile-embedded devices by 2013.

In 2010, GSMA issued its inaugural global awards for excellence in Embedded Mobile. The joint-winners in the Best Embedded Mobile End-to-End Service category were Samsung and KT for their connected digital signage and consumer electronics convergence service solutions.

In Asia Pacific South Korea has been one of the early leaders in M2M, where SK Telecom and KT have both already identified its strategic importance and potential. SK Telecom has created a new business division, the 'Industry Productivity Enhancement' centre, to develop new M2M technologies and B2B services[77], while KT has announced its plans to provide B2B M2M services on its 3G network[78]. The Songdo smart city in Incheon has teamed up with Cisco with the aim of building a smart fully-connected community , making extensive use of M2M connectivity.

In Japan NTT DOCOMO has been an M2M innovator, particularly in the automotive sector where they worked together with Nissan, AT&T and Telenor Connexion to develop and launch in 2010 the eco-friendly Nissan Leaf car. The embedded system allows the driver to use his mobile handset to remotely monitor and control a wide range of features such as vehicle charging, air conditioning, electricity costs and emissions. This is done through a VPN over NTT DOCOMO's mobile network and via a dedicated Nissan "Car Wings Data Centre".

Figure 30: The Nissan Leaf[80]



Beyond the leading-edge markets such as Japan and South Korea, operators are also seeing growth potential right across the region, including in emerging markets. For example, in June 2011 Telenor Connexion, the M2M division of the global operator, announced its intention to expand its presence in Malaysia to serve the fast-growing opportunities in South-East Asia[81].

The use of M2M to deliver m-Health services is arguably the fastest-growing area, transcending both developed and emerging Asian markets. By 2020, global revenues for M2M connected healthcare applications is predicted to reach approximately US$94 billion, with Asia Pacific accounting for 23% of this[82]. Countries such as Japan and South Korea see M2M communication as a way to relieve the pressure on the healthcare system of delivering services to a rapidly-ageing population. In emerging markets mobile health services provide an opportunity to address the issue of healthcare access for an under-served part of the population. For example, Korea Telecom's Ubcare system gathers data from the glucose-metres of its diabetic patients and automatically transmits the results to its u-Health Platform via 3G. Healthcare providers can then instantly spot problems and deliver targeted support to those patients that need it, rather than providing time-consuming blanket care to all patients. The solution is complemented with smartphone applications and web service solutions.

Overall M2M presents an attractive opportunity for Asia Pacific operators, presenting a very different model to their traditional consumer businesses. While these are, in most Asian markets, characterised by a large proportion of prepaid subscribers, short-term contracts and high churn rates, together with fast-declining voice and data margins, M2M offers opportunities to strike stable, long-term deals with business customers. While ARPU is generally relatively low this is offset by high volumes and the improved visibility resulting from longer contracts that will help operators to plan and manage their network capacity to meet demand. Global M2M revenues, both fixed and mobile, are expected to reach US$950 billion in 2020, representing 53% of total revenues from connected devices globally. If the revenue potential is proportional to the number of connections, Asia Pacific's mobile M2M revenues could reach US$70 billion by 2020[xi].

Although Asian mobile operators are well positioned to take advantage of these opportunities given the extensive wireless coverage from their existing networks and the business processes that they already have in place, several issues will, however, need to be addressed. One is the lack of common standards and platforms for M2M services. This is especially an issue given that much of the demand is likely to come from multinational corporations, who will seek globally standardised solutions. Another is how to reconcile the inherent instability resulting from the rollout of 3G and 4G networks with the long-term stability that M2M customers will look for when signing contracts. Thirdly, networks will need to be expanded, configured and optimised to handle the potentially huge increase in the number of connected devices and the differences between the data feeds and their quality of service requirements, especially in terms of time-criticality (e.g. a security breach alert vs. an hourly data feed). This presents an opportunity to the major Asian network infrastructure players such as Huawei and ZTE.

Finally, the above examples highlight not only the innovation potential of M2M but also the importance of mobile operators striking the right partnerships to develop and launch solutions in a way that maximises success potential and minimises risk, given the often considerable investments required. Strategic partnerships are required to maximise the viability of M2M. This can be between operators and hardware manufacturers, as in KT's relationship with Samsung. Operators can also partner with technology companies, both on the network side and on the business process and IT side, such as IBM and SAP. Finally, operators can consider partnering with M2M start-ups which have the innovation potential to provide the "killer apps" that may be required for M2M to take off in some sectors.

xi Based on 5.3 billion Asia Pacific connections (41% of 13 billion world total); 18% of which are mobile, giving approximately 900 million Asian mobile M2M connections, or 7.2% of total global M2M connections

3.4 The Mobile Broadband Readiness Index (MBRI)

While it is clear that there is rapid growth in mobile broadband, applications and services across Asia Pacific countries, it is also evident that not all countries are at the same stage of evolution. There has not been any authoritative tracking and modelling of the mobile broadband adoption cycle, nor has there been any macro-level classification made on the progress countries have made along this adoption cycle.

Different stages of evolution require different strategies to ensure that growth can be sustained. Therefore, the purpose of the MBRI is to show how the AP17 countries compare against one another from a 'readiness' perspective and identify means to sustain the growth from a market, regulatory policy and corporate strategy perspective. Countries that rank highly are considered further along the adoption cycle, and hence lessons can be learned from their progress for countries that are further down the ranking. The purpose is also not to identify winners or losers, rather to learn from each other how the various factors can be leveraged to drive mobile broadband adoption further within national boundaries. Also important to note is that the index is a relative comparison of AP17 countries. This means that a country may have made significant progress on the index metrics between 2009 and 2011, but if this is less than that of its peers then its position in the index may still fall.

Beyond this inter-country comparison, it is also important to acknowledge that within most countries there is considerable variation between urban and rural areas, with the latter especially scoring lower on those metrics in the Mobile Environment pillar such as 3G coverage and smartphone penetration. Like most indices, the MBRI ranks countries as a whole, which may implicitly improve the performance of "city-states" such as Singapore and Hong Kong compared to those lower-ranked countries with an urban-rural mix, such as South Korea or Australia, when in fact their mobile environments may not necessarily be more developed than those of Seoul or Sydney.

The 13 factors used in the index are shown in Figure 31. Each country has been scored on all 13 metrics on a 0-100 scale, relative to the performance of its AP17 peers, with the ranking based on a weighted average score out of 100. The detailed methodology, ranking and scoring for each of the metrics used is provided in the Appendix to this report.

Figure 31: MBRI Metrics and Weightings

	Weight	Pillar	Sub-Weight	Metrics
1	65%	Mobile Environment	15%	Mobile penetration
2			10%	Smartphone penetration
3			15%	Mobile broadband penetration
4			15%	3G population coverage
5			10%	Maximum access speed
6	10%	E-Readiness	5%	Fixed line broadband penetration
7			5%	Internet domains by country
8	5%	Market Profile	5%	Market competitiveness (HHI)
9	10%	Business Environment	7%	Regulatory environment
10			3%	Conditions for business - entrepreneurship
11	10%	Technology Environment	4%	Innovation environment
12			3%	Business use of internet
13			3%	Government effective use of ICT

The 2011 MBRI (see Figure 32) shows Japan at the top of the index, followed by Singapore. Japan's leading position is mainly due to its mobile environment. Japan has the highest smartphone penetration, 3G/4G population coverage and downlink speeds in AP17, while mobile broadband penetration is the second highest behind South Korea. Its e-readiness is also high, with the second highest number of internet domains providing a wealth of local content for mobile Internet users. Finally, the business environment is regarded as the most pro-innovation in AP17. Together, this creates the basis for high mobile data usage.

Singapore was the top-ranked country in the index in 2009 but ceded this position to Japan in 2011. This was mainly due to NTT DOCOMO's 4G, which significantly increased access speeds beyond those in Singapore. In the 2011 index Singapore remained a close second behind Japan, with the highest mobile penetration in AP17 at nearly 200%, indicating not only that nearly all Singaporeans will be connected to the mobile network but also that many of them have multiple SIMs that are used across more than one connected device, for example a smartphone plus a 3G tablet computer. This will drive up usage of mobile data services. Singapore scores highly in the business and technology environment categories, with the most favourable regulatory environment and highest business Internet usage in AP17, which provides a strong basis for investment and usage of mobile data services.

Hong Kong also rose by two positions in the index, leapfrogging Australia and South Korea into third place. This was mainly due to a large increase in mobile broadband penetration, stimulated by the launch in late 2009 by CSL of the Next G, described at the time by the operator as the "world's fastest All-IP mobile broadband network"[83]. CSL then followed this with the first Asian 4G launch in 2010, which led to a huge increase in access speeds.

The biggest mover overall between 2009 and 2011 was Vietnam, which rose from 13th to 9th in the index. Vietnam's mobile environment advanced considerably in that period, with mobile penetration surging from 86% to 126%. Vinaphone launched the first 3G network in 2009 with the other major operators following suit in 2009 and 2010. The resulting increase in access speeds and launch of mobile broadband services has also stimulated growth in smartphone adoption, leading to an environment ready for the uptake of mobile data services. In tandem the ranking of Vietnam's regulatory and innovation environments has also improved.

The two biggest fallers at the bottom of the index are Sri Lanka and Thailand. Sri Lanka has fallen behind on 3G coverage and access speeds. While it was ahead of most other emerging markets on both metrics in 2009, other countries such as Vietnam and China have since caught up and overtaken Sri Lanka. Thailand is also ranked lower in 2011 than in 2009 on most mobile environment metrics, including 3G population coverage and mobile broadband penetration, which was driven by the ongoing delays in 3G license issuance. As well as this, four of Thailand's business and technology environment metrics were ranked lower than in 2009: the quality of the regulatory environment, the business conditions for entrepreneurs, the innovation environment and the effectiveness of Government usage of ICT. Overall the combination of a relative deterioration of the business and technology environment and delays to 3G expansion have led to stagnation while most of Thailand's peers have made progress on both fronts.

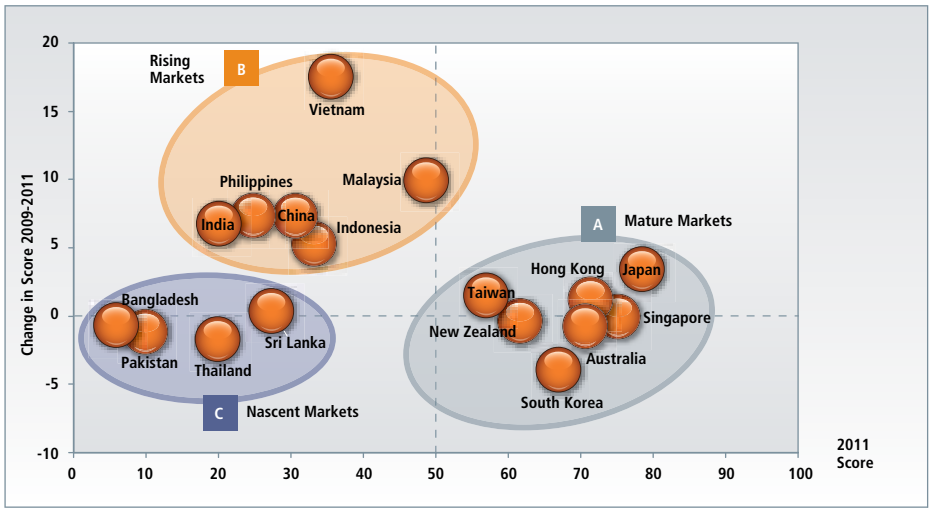
Comparing the two largest markets in the region, China has maintained its position above India in the 2011 index. Mobile, smartphone and mobile broadband penetration rates and 3G population coverage are all higher in China. China is also more e-ready, with higher fixed-line broadband penetration and the highest number of domains in AP17, although this is partly due to language with a higher proportion of English speakers in India increasing access to foreign sites. In addition, India's business and technology environments are perceived less positively than in 2009, falling two places in business Internet usage and four places on the conditions for entrepreneurs, which for example will impact SMEs developing data services (as described in more detail in Chapter 4). The underlying differences between the countries, the challenges faced by both and the regulatory requirements to drive future growth are detailed further in Chapter 6.

Figure 32: The Mobile Broadband Readiness Index 2011

2011 Rank	Country	Metric Rankings													MBRI Score	Change in Rank vs. 2009
		1	2	3	4	5	6	7	8	9	10	11	12	13		
1	Japan	10	1	2	1	1	3	2	11	5	7	1	3	3	78.7	+1
2	Singapore	1	2	5	3	8	5	10	13	1	3	3	1	5	75.2	-1
3	Hong Kong	2	6	4	2	2	2	4	2	2	4	8	2	-	71.5	+2
4	Australia	4	5	3	3	4	6	3	12	4	2	5	4	2	70.8	-1
5	South Korea	9	3	1	3	6	1	5	14	7	6	4	7	1	66.9	-1
6	New Zealand	7	4	7	7	7	4	12	16	3	1	7	6	4	61.7	0
7	Taiwan	6	8	6	6	12	7	13	4	8	5	2	5	-	57.1	0
8	Malaysia	5	7	8	11	2	9	11	9	6	9	6	8	6	48.8	0
9	Vietnam	3	14	10	10	10	10	9	8	12	13	13	14	14	35.6	+4
10	Indonesia	12	13	12	8	4	15	7	6	16	16	10	12	15	33.3	-1
11	China	14	10	13	8	12	8	1	17	13	15	8	15	7	30.8	0
12	Sri Lanka	13	12	11	13	12	13	17	5	10	11	11	10	13	27.4	-2
13	Philippines	11	11	9	12	16	12	15	15	14	14	16	13	8	25.0	+1
14	India	15	17	15	14	8	14	6	1	11	17	11	9	9	20.2	+1
15	Thailand	8	9	14	15	12	11	8	10	9	10	14	11	11	20.0	-3
16	Pakistan	16	15	16	15	11	16	14	3	17	8	15	16	11	9.9	0
17	Bangladesh	17	16	17	15	17	17	16	7	15	12	17	17	10	6.1	0

Note: Metric 13 (Government Effective use of ICT) not measured for Hong Kong and Taiwan

Figure 33: MBRI Score and Change in Score for 2009 – 2011[84]



The two lowest-ranked countries, Bangladesh and Pakistan, are unchanged between 2009 and 2011. They rank amongst the bottom three countries for 7 of the 13 metrics, including four out of the five mobile environment metrics. Having said this, both countries have shown growth across many of the metrics, for example Bangladesh's mobile penetration rose 18% between 2009 and 2011 while Pakistan has increased mobile Internet access speeds considerably. In addition, there are many positive signs in the market. Pakistan is the third most competitive market in AP17 and Bangladesh the seventh, based on their HHI scores. Also, Pakistan is the highest-ranked emerging market in terms of the environment for business entrepreneurs. Perhaps most critically, the quality of the regulatory environment is an area where both countries score in the bottom three. Addressing the regulatory priorities highlighted in Chapter 6 of this report is likely to help stimulate improvement across all of the key factors in the MBRI.

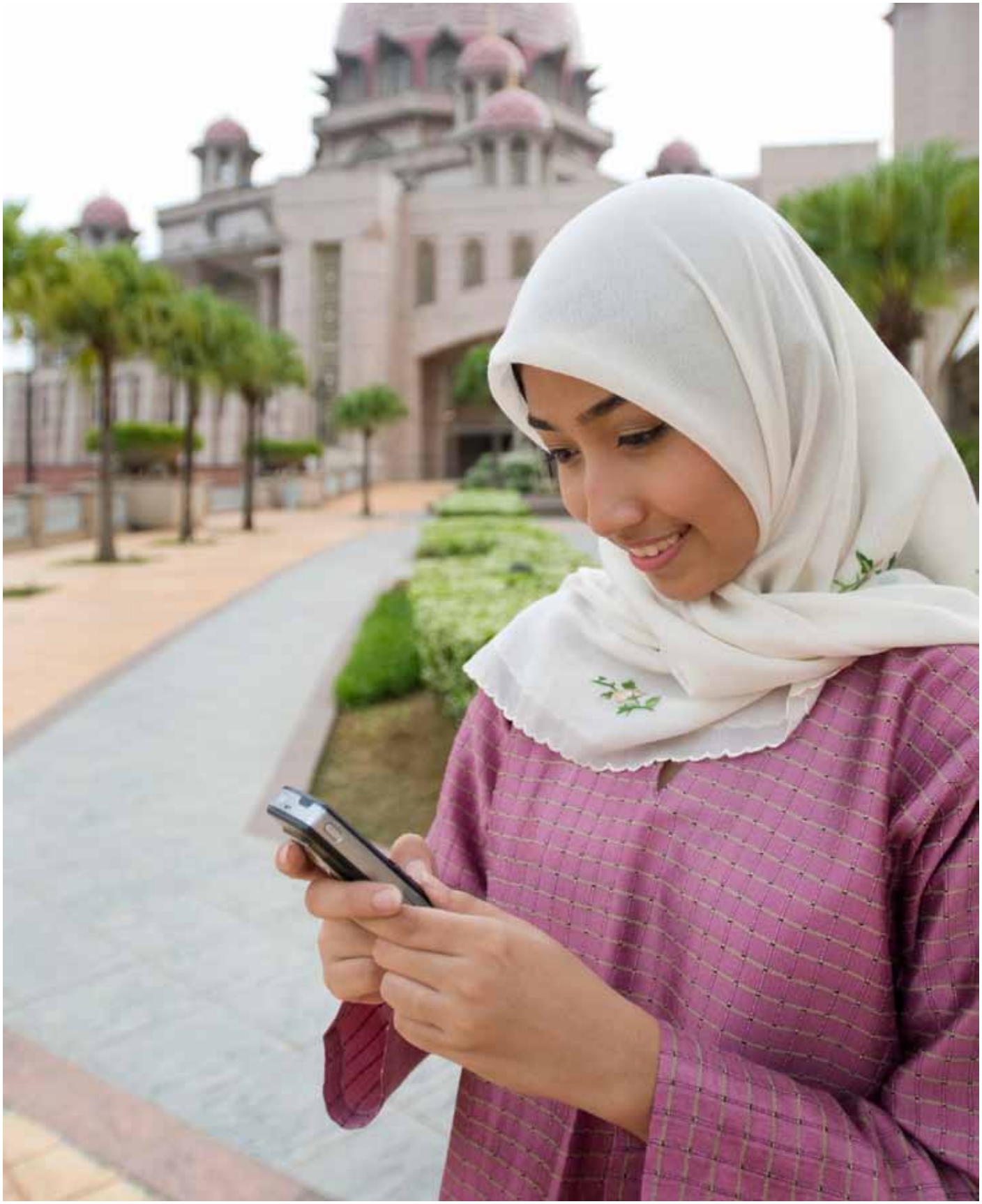
When bringing together the relative weighted scores that underpin behind the rankings together with the change in scores between 2009 and 2011 three distinct groups emerge. Cluster A comprises the developed markets that scored highly in both years. Cluster B is made up of lower-scoring countries that showed improvement between 2009 and 2011, indicating that they are closing their mobile data-readiness gap to the countries in Cluster A. Cluster C are those countries that scored relatively low in both 2009 and 2011, with three of these actually scoring lower in 2009 than in 2011, indicating a widening gap between them and their peers. From a public policy perspective, the approach needs to differ by cluster.

Mature Markets face the challenge of large data traffic volumes and growing diversity in their traffic profile, for example a rise in demand for M2M traffic. Regulators need to ensure that operators are able to differentiate on the quality of service provided and manage traffic to avoid potentially crippling congestion. Additionally it is essential that regulators ensure that sufficient spectrum is made available, for example through the digital dividend. Finally, telecom regulators should be considering how to take regional leadership to the global stage. This can be done through constructive policies on innovation and stimulation of the SME sector around the mobile sector, for example by creating economic and sector clusters, providing fiscal incentives and acting as a bridge between business, academic and public sector organisations.

Rising Markets face the challenge of massive increases in the volume of data traffic passing through networks that were in many cases designed with voice traffic in mind. Large-scale network upgrades are required. It is also essential that regulators ensure that sufficient spectrum is made available. In addition, to realise the full potential of these countries, all of which bar Malaysia have populations exceeding 80 million, network rollout to underserved rural areas is needed. In order to facilitate these requirements, regulators need to ensure that operators are able to build, own and share network infrastructure as needed. In addition, incentives and subsidies, potentially from monies collected in universal service funds, should be used to ensure that this expansion is viable for operators. Finally, the Government can play a key role in driving adoption of mobile broadband and mobile data services in leading by example and driving innovative public sector service provision over mobile platforms, as is the case in more advanced markets.

Nascent Markets need to concentrate first and foremost on driving growth in mobile penetration and the accelerated rollout of 3G networks. This should be by ensuring that 3G (and in future 4G) licenses and spectrum are distributed in a timely, fair and transparent manner, and at a price that does not restrict the ability of the operators to invest in network infrastructure that will drive up population coverage. In addition it is essential that telecom-specific taxes are removed, as they act as a barrier to adoption by pushing the cost of connectivity, handsets and data services beyond the reach of the masses.

The regulatory requirements for future mobile sector growth, including that of mobile data services, are discussed in detail in Chapter 6.



4. The Economic Contribution of the Mobile Industry

Key Messages:

Mobile operators' revenues in AP17 contribute 1.7% of aggregated GDP

The total value add of the mobile ecosystem in AP17 is almost US$485 billion or 2.66% of GDP

In addition, the mobile ecosystem plays a major role in national employment, with approximately 11.4 million people either directly or indirectly employed through the mobile ecosystem

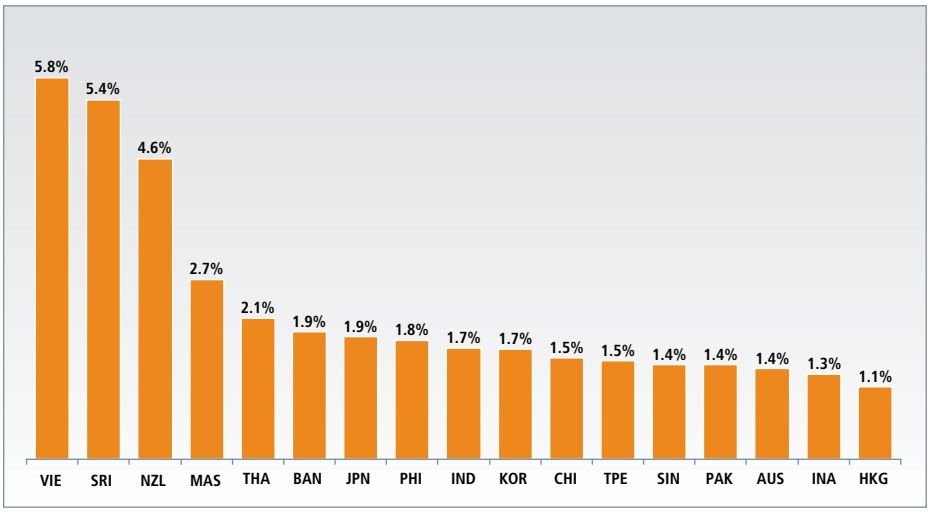
The mobile ecosystem is a major contributor to public funding with over US$298 billion generated through corporate taxes, social security, income taxes, indirect taxes and regulatory fees in 2010

The previous chapter highlighted the key role that mobile data services are playing in the everyday lives of Asia Pacific's citizens, and touched on the beneficial impact that this has on society and the economy. In this chapter, we focus in more detail on quantifying the direct and indirect economic contribution that the mobile industry is making to countries in Asia Pacific.

4.1 The Contribution of Mobile Operators to GDP

The phenomenal take-up of mobile communication in Asia Pacific has driven revenues for mobile operators in AP17 from approximately US$240 billion in 2008 to over US$310 billion in 2010. This represents a direct contribution from revenues of approximately 1.7% to aggregated AP17 GDP. At a country level (see Figure 34), this direct contribution from operator revenues ranges from 5.8% in Vietnam to 1.1% in Hong Kong. Vietnamese MNOs were also the highest contributors in AP17 in 2008 at 3.2% of GDP. The increase to over 5% has been driven by the huge increase in connectivity, with penetration rising from around 70% in 2008 to 126% in 2010 – second only to Singapore and Hong Kong.

Figure 34: AP17 Mobile Revenues Contribution as a Percentage of GDP[85]



The economic profile of each country also has a bearing on the relative contribution of the mobile sector to GDP. Sri Lanka and New Zealand, which are the highest after Vietnam, are both relatively small economies without a dominant sector but with successful mobile operators, hence their high relative contribution. In addition, although it fell by 10% between 2006 and 2010, New Zealand's ARPM is high relative to the rest of AP17 (see Figure 12). In contrast, Hong Kong and Australia are amongst the lowest. This is partly because they are more mature markets where competition is driving down rates. Indeed, the direct contribution from operator revenues is considerably higher among emerging countries (2.6% on average) than developed countries (1.9% on average). This is, however, also because these countries have large, dominant sectors in their economies – financial services in the case of Hong Kong and natural resources in the case of Australia – which will lessen the relative contribution of other sectors, without necessarily diminishing the role they play in the wider economy.

4.2 The Value-Add of the Mobile Sector

Mobile operators are part of a larger economic sector that delivers mobile communications to society; therefore the entire economic contribution of this sector to society needs to be considered. To estimate this direct and indirect economic contribution, a structured framework has been used (see the 'Economic Contribution Methodology' in Appendix) that takes into account the following elements:

Supply-side Effects

- The direct contribution from MNOs (as discussed above)
- The direct contribution from the adjacent industries in the value chain (see Figure 35)
- The indirect impact on the greater economy of the mobile sector (the 'multiplier effect')

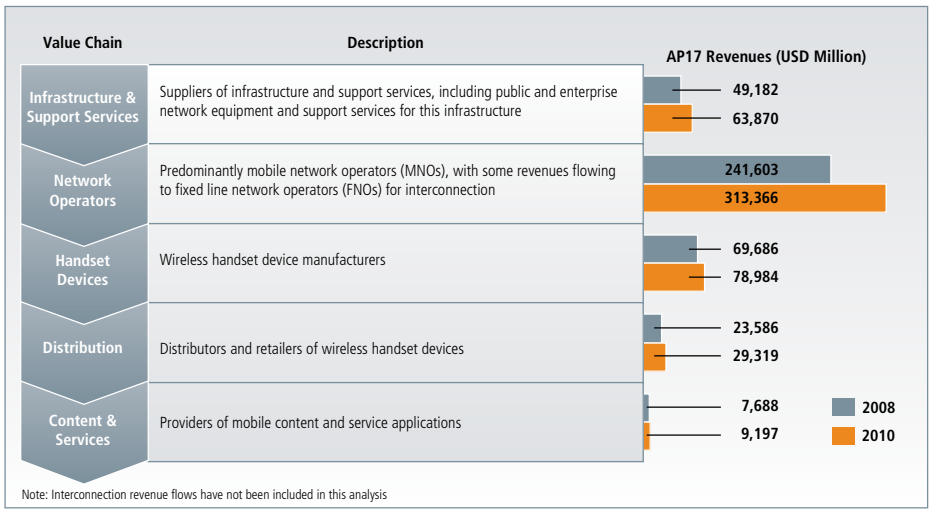
Demand-side Impact

- Productivity gain from workers using mobile technologies for work (this covers the range of individuals whose job is impacted by having access to mobile communications technology)

Broadly speaking, the mobile value chain consists of five components: infrastructure vendors and support services, network operators, handset devices, distributors, and content and services providers (see Figure 35).

Mobile operators made up approximately 63% of the entire value chain's revenues in 2010, which is in line with the share in in 2008 but an absolute increase of approximately 30% from the mobile industry's contribution of US$240 billion in that year.

Figure 35: Description and Size of Mobile Value Chain in AP17[86]

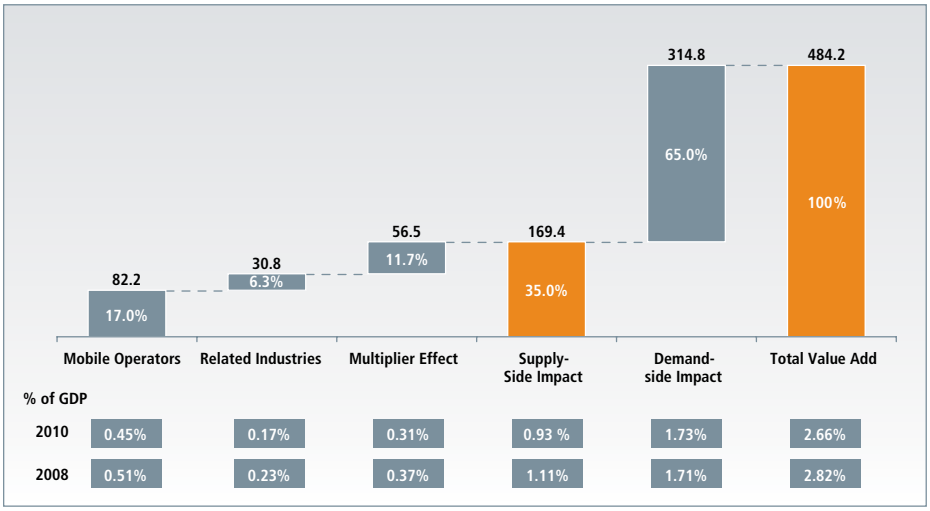


The total supply-side impact from the mobile ecosystem on the greater economy, contributed approximately US$169 billion in AP17 or 35% of the total value-add to the economy. Of this, around a third (11.7%) is attributable to the *multiplier effect*, indicating the strong positive ripple effect of mobile communications through greater economy.

Overall, there has been a decrease across the board on the supply-side in terms of the mobile sector's contribution as a percentage of GDP, relative to 2008. However, this is not to say that the contribution of mobile operators, infrastructure companies, device manufacturers, distributors and content and services have decreased from 2008. On the contrary, the absolute contribution from each of these sectors has increased from US$96 billion in 2008 to US$113 billion in 2010. The largest growth from related industries in 2010 was actually from the content and services sector which experienced a doubling of value-add from 2008, reflecting the enormous benefits to the economy provided by mobile content and data services (as described in Chapter 3).

On the demand-side the productivity gain from having a mobile-connected workforce was even more significant at approximately US$315 billion across AP17, equivalent to 65% of the mobile ecosystem (see Figure 36), up from US$224 billion in 2008. This growth was largely due to an increase in two factors, namely an increase the number of mobile-enabled workers (that is, the individuals who had access to a mobile phone), as well as an increase in average AP17 wage, thereby giving a larger overall workforce contribution. The growth in workers who have access to mobile communications was, naturally, driven by the two economic giants of Asia – China and India.

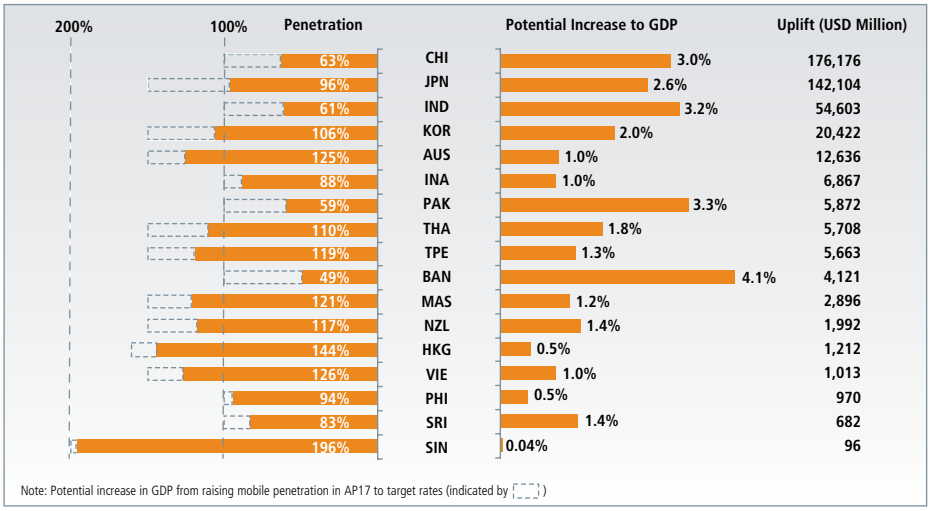
Figure 36: Mobile Sector Value Add (VA) in AP17 (in US$ billion)



In total, the direct and indirect economic contributions from the mobile ecosystem amounted to approximately US$484 billion, or 2.66% of the aggregate GDP in AP17 in 2010. This was lower than the 2.82% of GDP in 2008. Given the significant absolute growth on both the supply and demand sides, this indicates that the economies of Asia Pacific as a whole have been growing even faster than the mobile sector combined with the direct economic growth impact of mobile communications on other sectors (through the multiplier effect) and on newly mobile-enabled workers. This is somewhat contrary to the anecdotal evidence that we see of the enormous impact of mobile on everyday life across Asia, and suggests that there is a further impact beyond the factors included in the above calculation, which only considers companies and employees. As well as mobile-enabled workers, having mobile-enabled students, retirees and unemployed persons (to name a few) right across the population will undoubtedly bring even broader societal benefits to a country that then filter through to the economy, not least in their role as consumers. The societal impact of mobile communications is discussed in more detail in Chapter 5.

Beyond the direct contribution of mobile operators and the adjacent companies in the mobile value chain, there is significant indirect economic upside through driving mobile penetration, in other words a multiplier effect. This is particularly evident in emerging markets with low penetration rates, and which therefore have the greatest potential upside (see Figure 37). According to a 2009 World Bank report, a 10% increase in mobile penetration rate would incur a 0.60% GDP increase for high income economies, and a 0.81% increase in GDP for low middle-income economies[87]. Conversely, a highly developed market such as Singapore whose telecommunications industry is significantly more saturated, would only experience a small GDP uplift from further increasing penetration, as nearly all citizens who would benefit in an economic sense from owning a mobile phone already have one.

Figure 37: AP17 Potential Increase to GDP based on Mobile Penetration[88]



Note: Potential increase in GDP from raising mobile penetration in AP17 to target rates (indicated by [ ])

Overall, the variance in mobile revenues contribution to GDP, and potential increase to GDP can be attributed to a number of factors including:

- Mobile penetration rate (driven by affordability of mobile services, sophistication of services and infrastructure, and technology literacy, to name a few)
- Total GDP size, GDP per capita and average wage rates
- The proliferation of mobile services in the workplace (mobile workers in the workforce)

The countries with the most to gain in an economic sense are the large ones that still have a significant unconnected population. Even without taking into account multi-SIM ownership in those countries, the South Asian cluster of India, Pakistan and Bangladesh together have a population of at least 600 million people who do not yet own a mobile phone. Increasing mobile penetration to 100%, somewhere between 2010 penetration rate of the Philippines and Thailand, could boost GDP by between 3.2% and 4.1%, or a total of US$65 billion across the three countries. The uplift in China is even higher at US$176 billion alone.

Realising the potential GDP uplift relies not only on the actions of the mobile operators and other participants in the mobile value chain, but also a conducive operating environment in terms of the regulatory policies that will drive increased coverage, penetration and mobile phone usage, which in turn will lead to increased economic prosperity.

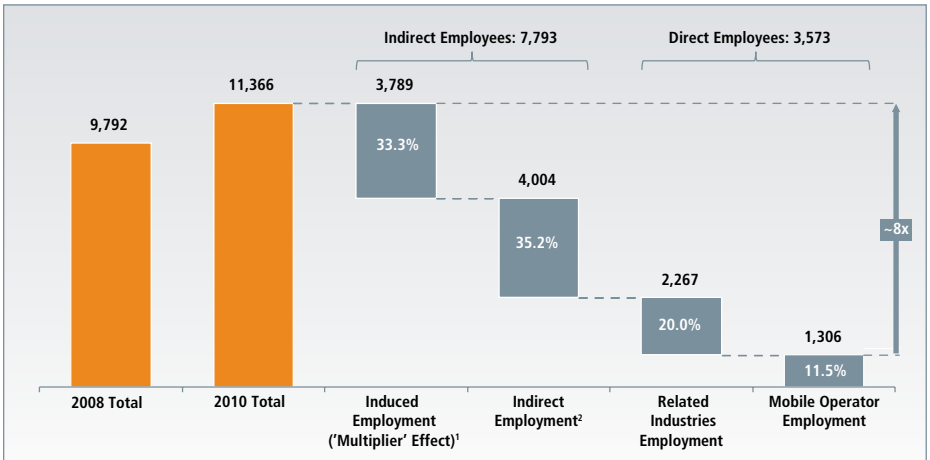
4.3 The Mobile Sector's Contribution to Employment

The mobile ecosystem also plays a pivotal role in contributing to employment. In 2010, nearly 11.4 million people were employed directly and indirectly in the mobile ecosystem, a 16% increase from 9.8 million employees in 2008 (see Figure 38):

- Approximately 3.6 million people were employed directly by the mobile ecosystem, of which approximately 1.3 million were employed by mobile operators
- Over 4 million people were employed indirectly through support service companies and the ecosystem's contribution to public funding
- An additional 3.8 million induced jobs were generated from direct and indirect employee spending (derived using the multiplier effect)

The employment increase from 2008 to 2010 can be largely attributed to the increase in indirect jobs throughout the mobile ecosystem. For example, Taiwanese electronics manufacturer Foxconn, has built an entire manufacturing city in Shenzhen, Southern China. The square mile "Foxconn City" includes not only factories to provide parts to both Asian and Western device manufacturers, but also education, medical services, and housing for its resident-cum-workers, which in turn, has created further opportunities for employment[89]. As seen in Figure 38, this strong ripple effect from mobile operators leads to approximately eight times more jobs being generated both directly and indirectly by the mobile ecosystem. This provides impetus for further development of the mobile industries across Asia Pacific.

Figure 38: Mobile Value Chain Contribution to Employment in AP17, 2010[90] ('000 Employees)



Note: (1) Induced Employment generated from spend of direct / indirect employees, calculated using a multiplier of 1.5
(2) Indirect Employment from Support Services Companies and employment generated from taxes paid Indirect

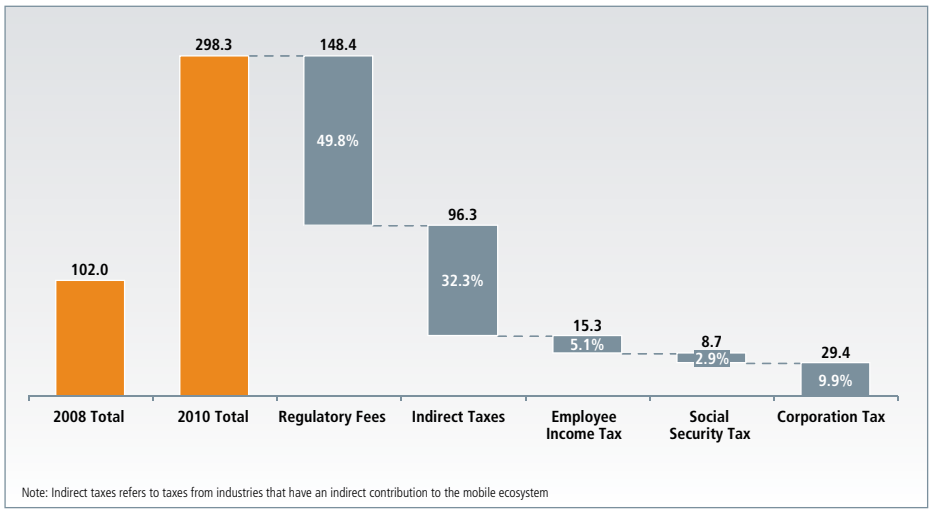
4.4 Contribution to Public Funding

The mobile ecosystem also makes a major contribution to public funding through various levers including VAT / indirect tax, corporate tax, social security taxes of direct and indirect employees, income taxes, and regulatory fees. It is estimated that the mobile ecosystem's total contribution to public funding in 2010 amounted to approximately US$298 billion, almost triple that of 2008 (see Figure 39).

This increase was mainly driven by (1) indirect taxes and (2) regulatory fees. Indirect taxes were derived from industries which contributed indirectly to the mobile ecosystem – VAS providers, device manufacturers, distributors and infrastructure and supply services. Compounded by the multiplier effect, there has been a significant uplift in the contribution of these industries to public funding. However, the largest contribution to public funding comes directly from regulatory fees operators are required to pay. These include license fees, spectrum fees and USFs, and amounted to almost 50% of total contribution to public funding.

India, with its 15 operators, was one of the largest contributors in license fees, with US$ 14.6 billion paid for 3G licences across the country, amounting to over 50%of the country's GDP[91]. Korean operators SK Telecom and KT paid a total of US$2 billion in 3G and LTE licenses between mid-2010 and early 2011[92]. Considering the scale of this contribution to public funding, it is important for regulators and policy makers who monitor the effectiveness of taxes to have close and constant conversations with the mobile operators, a topic that will be explored further in Chapter 6.

Figure 39: Mobile Ecosystem Contribution to Public Funding in AP17[93] (US$ billion)



Note: Indirect taxes refers to taxes from industries that have an indirect contribution to the mobile ecosystem

4.5 The Mobile Ecosystem Stimulating Competition

The mobile sector plays a key role in stimulating entrepreneurship and competition, particularly amongst small-to-medium enterprises (SMEs), a fragmented space that is difficult to define and analyse in its entirety, but which warrants some attention for further contribution to the domestic mobile ecosystem.

The role and growth of SMEs within the mobile ecosystem within this context can be considered from two angles – in the roles of SMEs as users and as producers.

A. SMEs as Users

With access to mobile technology, SMEs become connected to an information society, capable of receiving, creating and disseminating new and current information. Mobile telephony has helped entrepreneurs reduce costs and improve their business processes. In many developing countries, local fresh goods producers use mobile phones to find best prices for their produce, thus lowering their overall costs (for example, travel costs from conventional sourcing visits) and increasing convenience and efficiency.

For example, in 2009, Tata Teleservices began testing a technology that enables farmers to monitor their irrigation pumps remotely. The product, called Nano Ganesh, was created to solve the problem of farmers having to travel several kilometers to their irrigation pumps in a country where water, power and transport infrastructures are highly erratic. Often, on these trips, farmers would discover that they had travelled the distance only to find that no electricity was available to run the system. The technology allows farmers to dial a code from their mobile phones to connect to a wireless modem that attaches to the starter on the pump, therefore giving them the flexibility to monitor and control their electricity supply.[94]

By increasing yields and ensuring that they receive fair market prices, they make a direct contribution to GDP. In addition, this incremental income will help to lift them out of poverty more quickly, and increase their spending power and therefore consumption, further boosting GDP. It is therefore in the broader national economic interest to maximise high-quality connectivity in order to realise these benefits.

B. SMEs as Producers

There is a fast-growing opportunity for SMEs to take advantage of the boom in mobile data services described in the previous chapter. This is being supported by two key factors: the growing focus of the mobile operators on data services, and the supportive policies of governments and regulators.

The increasing focus of the large mobile operators on data services is leading to the emergence of a whole new sub-sector in the mobile ecosystem. While operators play a central role in the mobile ecosystem from a service delivery perspective, designing and developing new data services has frequently been outsourced. In some cases this can be done in a structural, strategic way, for example through SingTel's S$200 million venture capital fund Innov8, set up in 2010 specifically to invest in new innovative technologies[95]. This opens up a significant opportunity for smaller, more entrepreneurial and innovative players, which can also focus on niches that would be below the radar of the larger players.

SMEs are especially innovative in the area of *produsage* (a term referring to collaborative, user-led content creation)[96]. A recent paper published by infoDev on the virtual economy cites a so-called "two-sided marketplace" that brings together customers and independent producers, for example, through the Facebook application interface and iPhone App Store[97]. Indeed, both the Android and Apple operating platforms are structured in a way that encourages entrepreneurship. This has been further fueled through the easily accessible (from both technological skills and standardised payment platform viewpoints) software development kit; thus enabling a large number of individual developers to become successful entrepreneurs. Key success factors for these SMEs have included fast time-to-market, low development costs and low resource costs.

Governments and regulators have in some cases conducted a key enabling role. India in particular has become a hub for developers – both for local content creation and as a low cost outsource centre for international programming. To stimulate the growth of this sector, the Indian Government has taken measures, in three principal categories: (i) Fiscal policies; (ii) Customs benefits; and (iii) Infrastructure.

The first category incorporates income tax holidays, excise exemptions and other perks that can cut overhead and operating costs. The second includes custom duty reductions or exemptions on imports and exports of ICT services and components, which again can support entrepreneurs to minimise their costs during the crucial start-up stage when cash flow can be a challenge.

The third category is not cost-focused but arguably has been the most influential: a government-driven focus on establishing a leading ICT and mobile sector in their country. This can take many forms but is often in the context of stimulating dedicated ICT clusters of complementary firms, often focused on mobile technology. The establishment of these specialised clusters are cited as one of the key factors driving the advancement of the ICT sector in many countries, including India[98].

- In Thailand nine public and private organisations, including a software park, a telecom research institute, Microsoft Thailand and Intel Thailand, joined forces in 2011 in a project to drive the domestic development of mobile applications. The objective is to bring together the dispersed developers and SMEs across the country to stimulate further growth and innovation, and make Thailand a global player in mobile application development based around a talent pool of 30,000-40,000 developers.
- In Korea the city of Busan teamed with Cisco and Korea Telecom to launch Busan Mobile Application Development Centre (BMAC). This is part of a broader vision to develop "Smart+Connected Community" services and a green "u-City".[100] BMAC is intended to be a development and innovation hub where developers come together to work and share ideas, thus generating a powerful network effect.

Initiatives such as these are a prime example of ways governments can and have been encouraging further economic development based around mobile telecommunications, highlighting the recognition of the growing importance of the mobile industry to the broader economy.

It is evident that the mobile industry is a major contributor to the economic development of nations across Asia Pacific. Beyond its direct contribution, the mobile industry has a powerful carry-on effect on other industries within and beyond the mobile ecosystem. It generates significant economic value add to the economy, drives considerable direct and indirect employment, and contributes greatly to public funding, enabling governments to achieve their national development agendas. As governments consider levers to further develop their economies and societies, it will become increasingly important to consider the mobile industry as an enabler of development beyond its direct means. Investing in and creating the conditions for greater investment in the mobile industry will drive economic development far beyond its direct domain.

5. The Social and Environmental Impact of the Mobile Sector

Key Messages:

The mobile industry is having a profound collateral impact on society across Asia Pacific, creating efficiencies in communication, productivity and knowledge

The mobile industry is also involved in leading social initiatives that are yielding positive results, especially around improving the quality and delivery of public sector services like natural disaster assistance, mobile education programmes, mobile health, welfare distribution and public safety

In addition, the mobile industry is playing its part in reducing greenhouse gas emissions by directly improving its own energy-efficiency, and by indirectly supporting reduction of emissions in other sectors through technological innovation

Finally, Asian mobile operators are demonstrating commitment to the societies in which they operate through a variety of charitable and CSR initiatives

In Chapter 4 we illustrated the positive impact that the mobile industry has had on economic development, job creation and government funding. This contribution to government funding has supported governmental socio-economic programmes, like improving education systems, upgrading healthcare facilities or driving environment programmes.

Beyond simply contributing funds to governmental bodies, the sector is also having a much broader impact on society at large. This can be viewed in two ways:
a) Through "organised" efforts directly initiated and led by mobile operators, and
b) Through the collateral benefits to society, where mobile operators act as enablers through the connectivity and services that they provide.

While the former category generally receives the most coverage in both industry reports and company annual/CSR reports, it is the latter that has the most significant impact on society and on the everyday lives of its citizens and which we will therefore address first.

5.1 The Collateral Benefits of the Mobile Sector

The concept of the "digital divide", and the often impassioned debate that usually surrounds it, first emerged in the 1980s with the emergence of mass-market PC ownership, which sparked concerns surrounding the marginalisation of those who did not have access to this technology. The advent of the Internet in the 1990s led to an escalation of this debate as the benefits of being connected, and the impact of sections of society being "left behind" on the wrong side of the digital gap, became increasingly evident. Despite being the subject of many debates and numerous initiatives by the United Nations, the World Bank, and the International Monetary Fund, progress in bridging this gap has been slow.

As mobile Internet becomes a mass-market product in an increasing number of markets, we are now entering the third phase of the debate, around the mobile digital divide and who is on the right vs. wrong side of it. Applied to Asia Pacific's complex tapestry of countries, languages and cultures, is not a simple question of rural versus urban, or developed versus developing. Rather, it is a much more complicated debate that encapsulates factors including age, demographics, income levels, disabilities, education, and government regulation, to name a few.

As ever, "information is power", and with the arrival of mobile data services this now has a new angle – immediacy. Immediacy in itself is nothing without the realisation of some value, that is to say, the greatest value for the lowest cost (i.e. "efficiency"), and in this lies three overarching benefits of mobile broadband connectivity and the associated data services:

1. Communication efficiency
2. Production efficiency (i.e. productivity)
3. Knowledge efficiency.

1. Communication efficiency

As discussed previously, mobile communications have never played a more prevalent part in the everyday lives of people in Asia Pacific. With the plethora of communication options and most individuals being connected to multiple work and social groups, individuals need to maximise their communication efficiency. Mobile data communications provides a new multiverse of communication options that allow them to do this, through a blend of one-to-one, one-to-many and many-to-many communications.

For example, an ongoing trend in Indonesia is the mass adoption of BlackBerry handsets by the youth segment to take advantage of the embedded BlackBerry messenger (BBM) application that offers efficient one-to-many communication. As social circles adopt this as a standard part of their social planning, a failure to join the trend leads to a degree of "social

crippling" as the individual cannot join a group chat, plan an activity, and keep in contact with their peers. In a business context, mobile instant messaging has been reported to "supercharge the preparation, planting, growing and harvesting of *guanxi*[xii] networks"[101].

The ability of like-minded individuals to communicate and organise can have a significant impact on society, far beyond a group of friends organising a trip to the cinema. For example, mobile data communications have empowered the masses, by enabling them to connect and organise against better-resourced adversaries. The Malaysian general election in 2008 and the Singaporean election in 2011 were characterised by a particularly strong opposition for the first time in history, largely due to the use of social networking technology – which is increasingly being accessed via mobile handsets, tablets and PCs connected to a mobile network. This suggests that mobile in Asia is playing a lead role in furthering democratic reforms. Similarly, in recent Arab uprisings a disenchanted and physically fragmented but like-minded group of people were able to mobilise themselves through mobile communications.

In Asia, North Korea and Myanmar provide a powerful counter-example. While both countries feature a large oppressed, disenchanted population, the state's heavy regulatory control and restrictions on mobile connectivity place an enormous barrier to similar communication and collectivism, and is therefore arguably one of the many factors inhibiting political change. However, there can also be significant dangers lurking through communication efficiencies that require intervention by the authorities. For example, BBM is cited as having played a pivotal role in the London riots of summer 2011, by allowing youths to have real-time group conversations to plan the next attack and warn of police presence. Governments in Asia Pacific (and beyond) are still struggling to devise optimal intervention approaches that can curtail dangerous and illegal uprisings without censoring public liberties like freedom of speech.

2. Production efficiency

The constant quest for efficiency in our use of time and pressure to maximise productivity extends to many facets of our everyday lives – having a data-enabled mobile device provides great flexibility not only how we access information, but also where we process it. For example, recognising the time-constrained lives that Seoul's commuters have, supermarket chain Tesco launched a virtual supermarket in subway stations. Rather than walk the aisles of their local store after a long day's work, patrons are able to shop from a glass wall of subway stations with pictures of Tesco products, laid out as they would be in a traditional shop. Commuters purchase items by scanning Quick Response (QR) codes through their mobile phones, and items are then home delivered. The success of this application not only boosted Tesco's sales by 130% in three months, elevating it to the top spot as the country's largest supermarket, but it also increased their number of registered users to 76%. The virtual supermarket concept has since been deployed in 12 of Shanghai's busiest underground train stations.

The increased day-to-day productivity provided by mobile data has broader positive implications on our standard of living, our ability to contribute to society, and the economy. The half hour that a Korean commuter might have otherwise spent browsing supermarket aisles could now be spent getting healthy at the gym. Or the individual may decide to spend this time helping a local charity with fund-raising, to the benefit of Seoul society. Or she may spend that time working on a start-up business on the side, to the benefit of the Korean economy.

xii Guanxi refers to personalised relationships through networking, as is frequently used in China

3. Knowledge efficiency

Mobile data connectivity brings clear knowledge benefits. As of 2009, more than one third of the world's adult population was reported to have "no access to printed knowledge, new skills, and technologies that could improve the quality of their lives"[102], a substantial number of these individuals being in rural parts of Asia. The direct education benefits of m-learning are explored in detail later in this chapter.

Knowledge efficiency can have direct financial benefits. For example, an investor armed with a smartphone can react instantly to market news via an online brokerage with a dedicated smartphone application, rather than call his broker and lose precious minutes for his trade to be executed. A restaurant-goer armed with a smartphone can scan a "20% off" QR code on a subway advertisement on his way to the venue.

The knowledge provided by mobile-based location-navigation services avoid the risk of getting lost on the way to an event. In Japan, this type of service is immensely popular due to the reduction of uncertainty it brings to the individual – which is highly valued in Japanese society cultural mindset.[103] All of these benefits are equally important in helping a country become more competitive in the global economy.

Somewhat more trivially, the knowledge gleaned from mobile data can also inject a plethora of micro-benefits in everyday life. This could be the ability to look up the profile of a potential business client while on the way to a meeting, finding the local word for "thank-you" when in a foreign country, or settling an amicable dispute on the weekend's sport results between friends in a café.

Ultimately, the question thus remains on how to minimise the mobile digital divide by maximising inclusion and access to these efficiency benefits. This goes well beyond simple altruism to benefit the everyday quality of life of those individuals who are at risk of being "left behind". Much more than that, it is a critical driver of a country's competitiveness on the international stage. Mobile telecom regulators and policy-makers thus have a critical enabling role to play to ensure that the key factors are in place that are required to maximise uptake of mobile data services. Their decisions and actions will be decisive in terms of defining their country's ability to maximise utility from mobile data services, and therefore its efficiency and international competitiveness.

5.2 The "Organised" Impact of the Mobile Industry

The "organised" social initiatives led by the major players in the mobile communications sector are also having a significant impact along three dimensions:

1. Social impact, and how this improves the quality of life of the country's citizens
2. Environmental impact
3. Charitable impact, through corporate social responsibility programmes.

5.2.1 The Social Impact

The mobile industry continues to have a profound impact on social development in Asia Pacific. Mobile operators, mobile device manufacturers and others within the mobile ecosystem are uniquely positioned to leverage their core capabilities in technology, innovation and connectivity for the benefit of society. This can be as a complement to more traditional approaches to public service delivery by improving the reach or quality of a

certain service, or in many cases involves innovating to create an entirely new service that often has a dramatic impact on the quality of life of its users. While there are variations from operator to operator and from country to country, the industry has been active in making a social impact across four programmes in Asia Pacific:

- Disaster assistance programmes
- Education programmes
- Health programmes
- Social support and development programmes

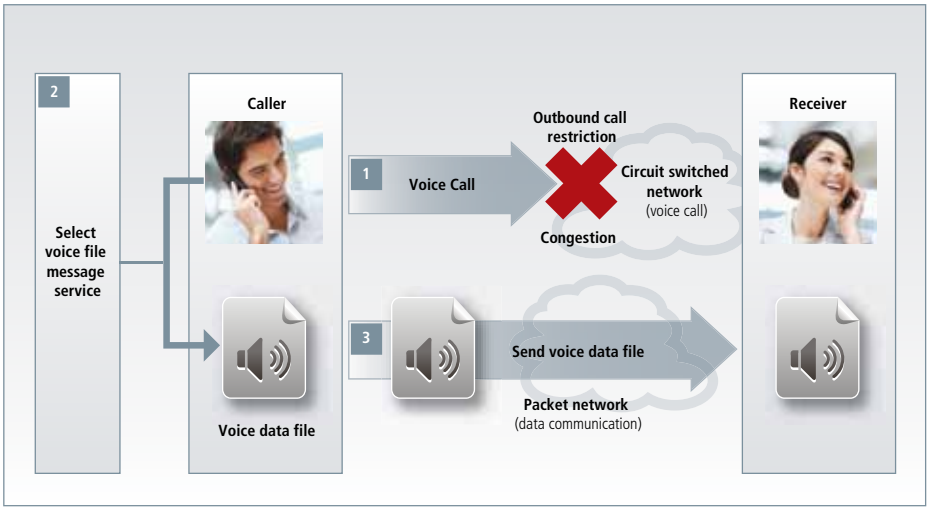
5.2.1.1 Disaster Assistance Programmes

Mobile operators have demonstrated a variety of innovative ways in which they use their extensive reach and network coverage to mitigate the impact of natural disasters – before, during and after the event.

When disasters do strike, the connectivity provided by mobile operators can play a critical role in maximising the effectiveness of relief operations. When the Japanese earthquake and tsunami arrived on 12th March 2011, Japanese mobile operators were quick to respond by reinstating communication to disaster-stricken areas through the use of their satellite infrastructure. Recognising the importance of communications at a time like this, NTT DOCOMO provided 900 satellite mobile phone units to evacuation shelters, 410 free battery charging stations, "restoration area maps" so that residents could track the state of repair and see the alternative communication facilities made available to them by the operator.[104]

Taking this one step further, NTT DOCOMO has developed a comprehensive disaster preparedness plan to embed disaster relief into its core operations and provide even better support in future. The ¥23.5 billion (US$300 million) three-point plan is based on securing communication in key disaster areas, further improving the response time and providing additional service to victims. The components include interruptible base station power supplies, making 3,000 satellite phones available to shelters and doubling the number of car-mounted and portable satellite-linked base stations. Perhaps the most innovative initiative was the development of a "Disaster Voice Message Service", whereby voice messages were delivered by IP after converting them into data files to avoid the network congestion issues that frequently arise during a natural disaster (see Figure 40).[105]

Figure 40: NTT DOCOMO Disaster Voice Message Service[106]



When the 2010 Yushu earthquake struck, China Mobile, China Telecom, and China Unicom quickly mobilized their resources for emergency support. They used their satellite infrastructure to provide emergency connectivity to aid workers within two days of the disaster, as well as real-time weather information, and secondary disaster warnings. In the recent flood crisis in Johor and Negeri Sembilan in Malaysia, Celcom established six Celcom Relief Centres in flood-prone areas, manned by forty people, to provide a means for flood victims to communicate with their loved ones, including handing out free starter packs with airtime and free domestic calls to their families.[107]

Operators also play a critical role in acting as an intermediary between the authorities and the afflicted parties, usually worried family and friends. When a landslide struck Zhouqu in 2010, China Mobile set up a "Family Connect Hotline", which handled over 10,000 calls and helped 1,200 customers locate or obtain information on their families[108]. When the 2011 earthquake and tsunami hit Japan, NTT DOCOMO set up a disaster information library that acted as a database whereby people could enter the mobile number of the person whose safety they wished to confirm. KDDI also established a disaster message board that allowed for unified searching across all five mobile operators; with this the public were able to place messages to find their loved ones via their mobile phones.

Mobile operators also play a key role in mitigating the impact of a disaster in the first instance by providing advance warning systems. In Bangladesh, a country prone to natural disasters, Grameenphone and Teletalk have taken the lead in developing an automated disaster early-warning system to citizens of the two most vulnerable areas, the flood-prone north-central Shirajganj district and the cyclone-prone Cox's Bazar district[109]. In collaboration with the Bangladeshi authorities, the operators send early-warning text messages to their subscribers who are at risk to reduce the number of people caught unawares by these natural disasters, thereby saving lives and minimising damage to property.

Finally, in the post-disaster period, both domestic and foreign mobile operators have launched SMS and fund raising campaigns in efforts to aid the victims and parties involved. The Association of Mobile Telecom Operators of Bangladesh started a campaign for Japan earthquake and tsunami victims called "Stand by a Friend". Under this initiative, subscribers could send an SMS to their mobile operator which would translate to a donation. In addition, all Robi shops in Bangladesh had marked aid boxes to collect cash donations from customers.[110]

5.2.1.2 Education Programmes

The mobile industry has demonstrated that it can play an important role in improving access to education, especially for those who cannot physically attend learning institutions. Studies by the International Review of Research in Open and Distance Learning have shown that m-Learning widens the availability of quality education due to decreased cost and increased flexibility of education administration and policy[111].

In the Philippines, a study was carried out by Molave Development Foundation Inc. (MDFI) and the Ministry of Education called project MIND. The main goal of the study was to determine the viability of using SMS as part of a blended learning package for distance non-formal education. Two learning modules, English and Maths, were delivered with the use of text messages. The results of the study indicated that the SMS-based learning was particularly beneficial for below-average students as it made learning more attractive. Based on the success of the programme in the Philippines, MDFI partnered with the English for Special Purpose Foundation and Health Sciences University of Mongolia to launch a similar initiative for students wishing to learn English in Mongolia.[112] This demonstrates the potential to export successful initiatives into other emerging Asia Pacific countries facing similar challenges.

m-Learning initiatives are not by any means restricted to emerging markets. The New Zealand government is looking to mobile learning as an ideal mechanism to ensure that rural schools are connected to the national education system. Vodafone and Howick College have pioneered the m-Learning initiatives in the country, where digital lessons are 'zapped' into various mobile devices, thereby enabling the students to pick up their studies at any location and any time[113]. Since its inception the programme has won the Global Innovation and Collaboration Teaching award in Hong Kong and paved the way for further mobile learning initiatives in the country[114].

5.2.1.3 Health Programmes

Access to high-quality and reliable healthcare remains a key challenge for society across much of Asia Pacific, particularly in remote or rural areas. The mobile industry can help to fill this gap and play an important role in addressing this problem through mobile health (m-Health) services.

The stakeholder environment for mobile healthcare is extremely complex and includes consumers, patients, carers, providers and suppliers, payers, regulators and governments (and NGOs), with an increasing focus on payers as the key stakeholder. Each stakeholder has their own requirements, but m-Health solutions tend to be focused on one or more of the following benefits:

- Improved quality of care (e.g. better and/or faster diagnosis, improved treatment compliance, access to healthcare professionals, support for carers, etc.)
- Reduced healthcare costs (e.g. fewer number of physician appointments, shorter hospital stays, avoidance of unnecessary admissions, etc.)
- Reduced chances of medical or administrative errors (e.g. by avoiding duplication of data entry, better coordination in multi-disciplinary settings, etc.)
- Increase efficiency (e.g. in administrative processes, billing, etc.)
- Improve knowledge base (e.g. epidemiology statistics, research databases, etc.)

Malaysian operator Maxis has launched the world's first health multi-platform mobile reference centre, across mobile- and fixed-line internet, WAP and SMS, with the goal of providing instant, user-friendly, professional-quality healthcare advice. "Pocket Doctor" has a wide range of services, including daily tips, first aid information and a symptoms-analyser function. Subscribers benefit from avoiding the time and cost of a doctor or specialist consultation, particularly those in rural parts of the country.[115]

As well as reference tools, basic 'push' solutions have been used to increase awareness of health issues. In Vietnam the challenge faced was how to provide health advice and support to the population living in remote parts of the country. NGO Pathfinder International launched an SMS-based m-Health project, funded by the Rockefeller Foundation, which focuses on ethnic minority and underserved populations in the Central Highland and Northern Mountainous areas in Vietnam. Messages include information on sexual health, non-communicable diseases and health insurance. Initial success has raised the prospect of a nation-wide launch and the expansion of the initiative by Pathfinder International into other developing countries.[116]

In addition to an improved knowledge base, m-Health platforms can also provide an improved quality of care. In India, Aircel launched the 'Aircel Apollo Mobile HealthCare' m-Health solution in association with the Apollo Hospitals Group, to provide on-demand medical consultation, anytime, anywhere. The programme has two main products; TeleMedicine, which provides interactive health-care advice in real time online, and TeleTriage, which offers the possibility of managing patient symptoms via a telephone interaction with a doctor. The programme aims to benefit its subscribers by providing enhanced access to care for patients living in rural/remote areas, while also reducing healthcare delivery costs and overcrowding in hospitals.[117]

m-Health has proven to be a highly flexible channel, providing the flexibility required to transcend the variety of cultures in Asia and their values. For example in Dhaka, a partnership between the Bangladeshi Rural Advancement Committee (BRAC) and Click Diagnostics resulted in the creation of "Manoshi", which is a mobile based data collection software that seeks to address the reluctance of many pregnant Bangladeshi women from visiting hospitals. This software enables health workers to visit patients at home and collect vital maternal, neonatal, and child health information which is then posted on a secure, private page, where doctors can also provide feedback and advice. In addition, Manoshi uses an algorithm to automate risk assessment based on each patient's data, and prioritises work schedules based on patient risk. The success of the Manoshi platform has led to its expansion across Bangladesh.[118]

Success in m-Health in APAC countries is anecdotal at best, a lot remains to be done. For any m-Health solution to achieve widespread success and adoption, it must be seen as addressing critical health needs. In APAC countries with highly developed health systems (where spending is 10% or more of GDP), the focus tends to be on reducing system costs through efficiency, improving management of chronic disease, and prevention of disease. In those countries that are expanding their health systems, the focus is more on novel and cost effective ways to deliver basic health services in a commercially viable manner. This critical issue has been further elaborated in a thought leadership paper that A.T. Kearney has developed for the GSMA.

5.2.1.4 Further Social Support and Development Programmes

With the improvements in the availability of mobile technology, mobile operators have found innovative ways to help local authorities deliver other services beyond the much-vaunted m-education and m-Health categories.

Getting money to those who need it is a logistical challenge in all countries, especially those as large and topographically challenging as the large Asian nations. In the Philippines, Globe Telecom works with the Department of Social Welfare and Development (DSWD) and the Lank Bank of Philippines (LBP) to overcome this problem by expediting the payment of grants to beneficiaries in the remote Cordillera region of northern Luzon. The initiative is centred on Globe's G-Cash platform to make payments quickly to grant recipients, especially those without access to LBP servicing banks.[119]

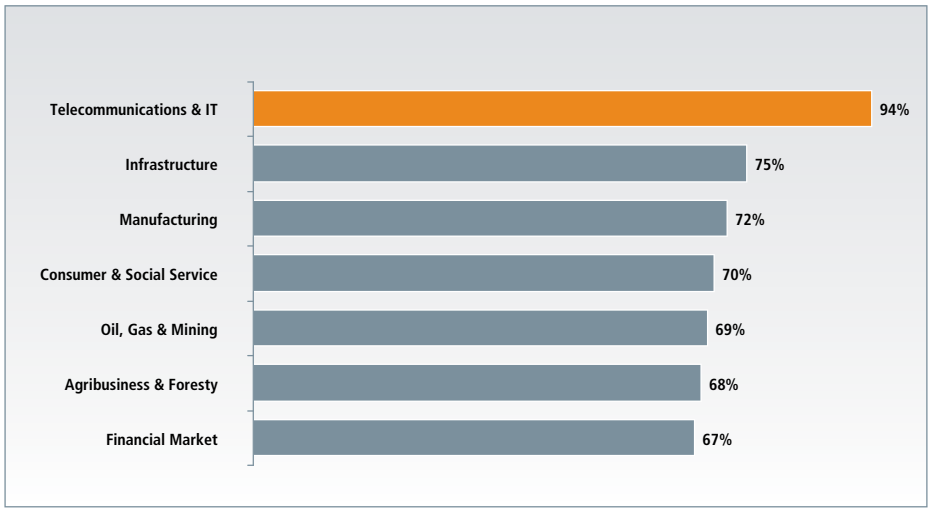
Public safety is another area where the mobile sector offers local authorities a way to deliver much-improved services, for example through real-time location based services. In Malaysia, the Selangor police department created an application called 'My Distress' which seamlessly connects the victims to the police force. With this application, the public is able to signal for help in emergency situations simply by just pressing a button on the smartphone, which then connects the distress signal, indicating the victim's location, to the nearest local police branch[120]. A similar application has been launched in India, where a user can post an SOS message on their Facebook and Twitter accounts through a single push of their phone button[121]. Similarly, Telecom New Zealand has set up a free service enabling its subscribers to record their location or activities. The 'SAFE' programme aims to reduce missing person cases by allowing individuals to register their location when they are walking home alone at night or getting into a vehicle with an unknown driver.[122]

Mobile operators and device makers have also customised their products and services to cater for special needs. In Singapore, M1 launched two new mobile service plans in 2011 exclusively for deaf clients. Aside from cheaper rates, it also includes free incoming video calls and unlimited free calls to three M1 numbers.[123] Samsung launched the Touch Messenger braille phone as far back as 2006[124], while in 2011 LG designed a concept watch phone for the blind, the Surface, also featuring a braille keypad.

5.2.2 The Environmental Impact

According to Gartner, the ICT sector accounts for just 2% of the world's global carbon emissions[125]. In addition, the environmental performance of the ICT sector is generally superior to that of other sectors. For example, the International Finance Corporation's (IFC) tracks the environmental and social performance of its projects by sector versus a defined set of performance targets. In 2010 94% of IFC-funded investments in the Telecom & IT sector met their targets in that category, compared to 75% or less in the other sectors in which it is an active investor (see Figure 41).[126] Assuming that these IFC projects are reflective of the industry as a whole, this indicates the positive environmental and social contribution that can be made by the telecommunication sector. Furthermore, according to Newsweek's 2011 Green Rankings, 13 operators[xiii] made the top 100 list of the world's greenest global companies.[127]

Figure 41: Environmental and Social Impact – IFC Project Performance Comparison by Sector[128]



Despite not being one of the major polluters, mobile communication technologies are very much part of the solution and vital to combating global warming, as emphasised by UN Secretary General Ban Ki-Moon at the ITU Telecom World 2009 Conference[129]. There is a growing trend of Asian mobile operators being proactive in their approach to environmental issues and developing and implementing solutions of their own, both for altruistic and economic reasons.

These can be grouped into 2 categories:

- Direct Measures to reduce greenhouse gas (GHG) emissions
- Indirect Measures to reduce GHG emissions.

xiii Includes BT Group, Swisscom, Bell Canada Enterprises, Sprint Nextel, Telecom Italia, KPN, Telefonica, France Telecom, Vodafone, NTT / NTT DOCOMO, Deutsche Telecom, TELUS and AT&T

5.2.2.1 Direct Measures to improve the energy efficiency of the mobile industry

Mobile operators and vendors are finding innovative ways to increase energy efficiency as well as reduce greenhouse gas emissions, especially in the deployment and operation of their mobile networks. There are 3 broad areas:

- Implementing low- or zero-emission power solutions for base stations
- Reducing emissions and carbon footprint relating to mobile products and devices
- Increasing efficiency in their everyday operational activities, including office, facilities and materials management.

Base Station energy optimisation

Asian operators and equipment vendors are arguably at the forefront in terms of the development and deployment of environmental-friendly solutions for base stations. Operators in countries with poor electricity grid supply, who are forced to use diesel generators as backup, have found difficulty in optimising their overall power costs. As a result, these operators have been quick to trial and implement alternative energy solutions, which are often also environmentally friendly. Equipment vendors have seen this trend and have invested in developing renewable energy solutions that harness the power of solar, hydrogen and other environmentally-friendly sources. By implementing these new environmentally-friendly solutions, operators have found new means to reduce power consumption and their own carbon footprint. Furthermore, the benefits have extended beyond just a reduction in emissions to achieving cost savings and extending network coverage to off-grid areas without a stable power supply.

In Bangladesh, Huawei and Grameenphone deployed hybrid solar-powered base transceiver stations under the "Building a Greener Mobile Network" programme that reduced energy consumption by 43%, leading to an emissions reduction of 700 tons per annum. As well as the energy- and cost-savings from eliminating the need for site visits for refuelling, the new system has improved Grameenphone's network performance by preventing service interruptions that had been common due to the instability of the traditional grid power infrastructure and diesel generators.

Besides solar-powered sites, hydrogen fuel cells are increasingly being used as an alternative green energy source. This eco-friendly system produces only water as a by-product. Indonesia's Axis implemented its first hydrogen BTS in 2009 by collaborating with start-ups such as Electro Power Systems from Italy (recently named Technology Pioneer 2012 by the World Economic Forum). Telstra deployed its first hydrogen fuel cell back-up system in 2010 and in 2011 China Mobile announced the integration of its first hydrogen power system into one of its base stations.[130]

In an all-Asian collaboration between operator and technology provider, Malaysia's Celcom has deployed about 2,000 new sites employing Huawei's single Radio Access Network (RAN) solution that maximises the efficient use of base station energy by replacing the separate 2G and 3G systems with a single power solution. This will lead to a reduction of Celcom's power and total cost of ownership.[131]

Mobile device energy efficiency

In a late 2009 report, Boccaletti, Loffler, and Oppenheim predicted that worldwide growth in mobile phone usage would triple the mobile industry's carbon footprint by 2020, largely because of their consumption of silicon and rare metals[132]. In order to mitigate this, there have been many technological breakthroughs by the Asian device manufacturers. For example, Samsung has introduced a phone called the 'Blue Earth Touch Screen Phone' made entirely from recycled plastic from water bottles and free from harmful substances such as brominated flame retardants, beryllium, and phthalate[133]. In parallel LG has pledged to remove such harmful substances from the manufacturing process and increase the usage of green packaging across its entire line of mobile handset models.[134]

Another global eco-friendly initiative is the launch of a universal mobile charger, which is being introduced globally by 2012 under the GSMA flag. GSMA estimates suggest that the initiative could lead to 50% fewer chargers being manufactured each year[136]. Based on GSMA calculations, this initiative will reduce the mobile industry's greenhouse gas (GHG) emissions by 40% to 21.8 million tonnes a year.[137]

An additional, efficient method to reduce GHG is the recycling of mobile devices to reduce pollution, GHG emissions and conserve energy. Nokia has launched a recycling initiative in Singapore and Malaysia where mobile users can drop their old phones at the kiosk to be recycled as well as leave their devices for servicing . Japanese mobile operator KDDI has achieved mobile phone material recycling rate of 99.6% and communications equipment material recycling rate of 98.5%.[138]

Reducing other operational emissions

Several mobile operators are also introducing green initiatives in their other operational support activities, for example through their waste management and procurement. For example in the Philippines, Smart implements a community waste management programme that benefits both the environment and the participating communities. This recycling project involves rural villagers recycling tarpaulin materials from Smart's local advertising billboards into tarp bags, which are then sold to Smart or other potential buyers as a source of additional income for the villagers.[139]

Besides that, some Asian mobile operators are moving towards simple but effective green procurement activities, ranging from the purchase of energy-saving light bulbs to workplace canteens serving organic food to the purchase of recycled printing paper. In 2010, Taiwan's Chunghwa Telecom doubled its investment in green procurement initiatives to US$14 million.

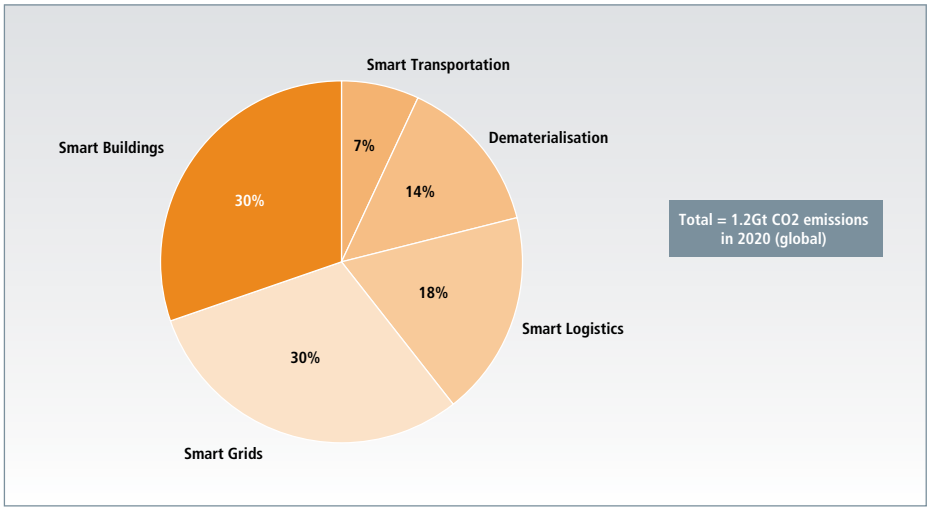
5.2.2.2 Acting as a catalyst to enable emissions reductions in other sectors (Indirect Measures)

The mobile industry is acting as an enabler for driving carbon emission reductions across numerous other industries, including through the use of Machine-to-Machine (M2M) mobile technologies to deliver 'smart solutions' (as described in Chapter 3). Smart solutions enabling energy efficiency through the use of mobile technology can be categorised into five types:

- Smart grids and smart meters solutions including electricity network monitoring, and electricity and gas metering
- Smart buildings and appliances which use mobile and other ICT technologies to deliver highly energy efficient, low-emission buildings both for new and existing building stock.
- Smart logistics solutions including fleet tracking systems and load optimisation
- Dematerialisation, the substitution of high carbon products and activities with low carbon alternatives (substituting face-to-face meetings with video-conferencing)
- Smart transportation solutions including synchronised traffic and notification systems, onboard telematics to encourage eco-driving, congestion management, routing and journey management optimisation, and road pricing

The "Carbon Connections" and "SMART2020" GSMA studies[140] indicate that the mobile industry can achieve GHG savings of 1.2 gigatonnes of CO2 emissions by 2020, provided that initiatives are rolled out worldwide across these five areas. The biggest opportunities are in smart grids and smart buildings (see Figure 42), which together account for 60% of the potential reductions. Examples of initiatives that have been implemented across these five categories are given below.

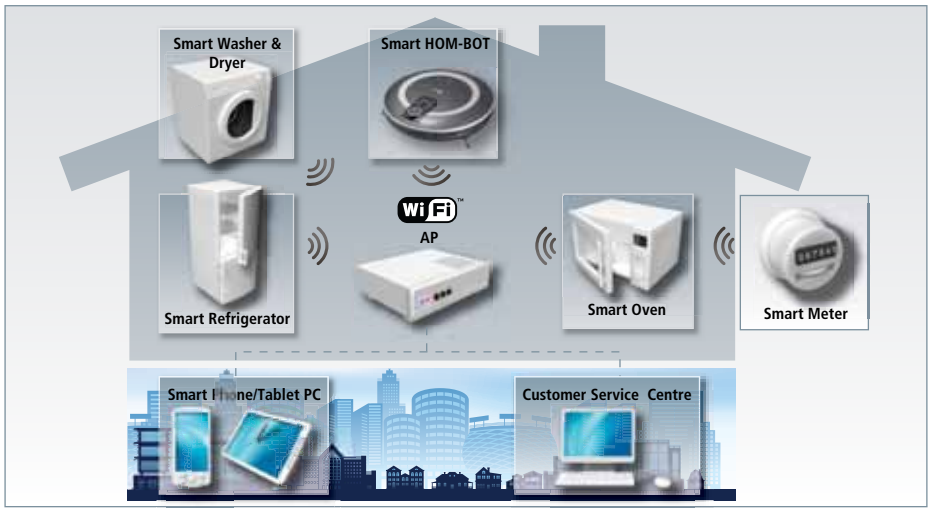
Figure 42: Relative Environmental Impact of Smart Green Solutions[141]



Smart Grids and Meters. Telecom operators are providing telemetry solutions for data transfers between smart meters in consumer homes to the power infrastructure. For example, in Australia the Government has invested US$100 million on a "Smart City" demonstration project. As part of this programme, a total of 50,000 smart meters and about 15,000 homes have been given in-home energy management systems to track electricity, water use, and CO2 emissions.[142] The programme is headed by Energy Australia, which uses a 3G network to deliver the connectivity. In South Korea all three major South Korean mobile operators are playing a leading role in the Jeju island smart grid demonstration project through the provision of wired and wireless networks, including 3G and WiMAX, for smart meter data transfer. The Jeju island project is planned to act as a pilot for the commercialisation and industrial export of smart grid technologies.[143]

Smart Buildings. 'Smart buildings' incorporate a blend of technologies related to designing, creating, and operating buildings more efficiently. The latter includes building management systems (BMS) that run heating and cooling systems according to the occupant's lifestyle or even the ability to switch all the PCs and monitors off in the office after everyone has gone home. Many solutions incorporate M2M technology and embedded mobile solutions, as described in Chapter 3. In Korea, LG has unveiled a full range of home appliances that allow home owners to manage their refrigerator, washing machines, ovens, and robotic vacuum cleaners via a smart network (see Figure 43). LG's smart system can, for example, notify a building owner via their mobile device about minor situations, such as leaving the refrigerator door open, or a more major one, such as leaving the gas on. In the instance of leaving the gas on, customers are given the option to turn the gas valve off remotely using a mobile device. These innovations will potentially save energy, time and cost – not to mention lives if gas-related incidents are avoided.[144]

Figure 43: The LG Smart Home[145]



Smart Logistics. In Australia, Telstra has developed and deployed its own fleet management logistics solution with GPS technology provider Trimble. By combining GPS, internet, and wireless technologies, customers can manage and track their vehicles via any web-connected mobile device connected to an application server. Customers can improve operational efficiency by identifying real-time fleet vehicle locations and nominating the closest one for each assignment. By implementing this solution on its own fleet Telstra has realised productivity savings of around 20% and lowered its fuel costs by over 6%.[146]

Dematerialisation. Conventional high-carbon office related activities and products are being replaced with lower carbon alternatives, with the mobile technology being a key driver of this trend. Leading by example, Vodafone Group has reported to have implemented 650 videoconferencing facilities, which has helped to reduce the number of flights taken by its staff by 30% and indirectly reduce the group's carbon footprint.[147]

Some industries capitalise on mobile technologies to both lower their costs and carbon footprint, as well as improve their customer experience. In Malaysia, local cinema operator GSC sends its customers tickets in the form of MMS barcodes, thus avoiding the need to print paper tickets[148]. Korea Telecom and Hyundai have together jointly developed an on-board device that uses a mobile network to connect to a "vehicle diagnostic centre"[149]. This centre provides advice on fuel-efficient driving, based on previous driving patterns and real-time traffic updates. M2M technology is already playing a key role in increasing automation, and thereby reducing the need for carbon-producing activities, as detailed in Chapter 3.

Smart Transport. Furthermore, mobile technology has been used to reduce public transport emissions. SK Telecom and taxi companies in Seoul, Busan, Daegu, and Incheon City together developed a taxi call service using GPS technology to allocate taxis to customers. On receipt of a customer request, a notification message is sent to all taxi drivers within a 1.5 kilometre radius of the customer, and the nearest available taxi is then despatched, thus leading to overall time and fuel efficiency. Over 55,000 taxis use this system, which has also been replicated in many other cities globally.[150] SK Telecom also developed a bus transport information system that provided readily accessible and real-time data to passengers on their handsets, thus contributing to a 30% increase in daily bus usage in Gyeonggi-do province.[151]

5.2.3 Corporate Social Responsibility by Mobile Operators

Finally, companies in the mobile sector continue to implement their own Corporate Social Responsibility (CSR) initiatives. The three types of CSR activities in mobile are can be classified into:

- Subscriber donation programmes
- Organisation-led initiatives
- Employee participation programmes.

Mobile operators have made it easier and more transparent for subscribers to make charitable donations to good causes in their communities. For example, in New Zealand Vodafone's 'Starships National Air Ambulance Service' programme enables customers to regularly donate to the foundation through their monthly bill.[152]

Mobile operators also directly undertake charitable initiatives to the benefit of their local communities. For example Robi in Bangladesh has launched an 'English in Schools' programme where 1,000 secondary schools are given 3 copies of an English-language newspaper five days a week, together with supplementary tutorial pages as a learning tool for both students and teachers. Robi also launched an initiative with the Rural Service Foundation in 2010 to provide 500 rural homes with solar panels, giving them electricity for the first time.[153]

In Australia, Telstra has a range of social impact programmes. Total community contributions in 2010 amounted to a value of around A$25 million (US$21 million), which included a range of sponsorships, volunteering programmes and donations to good causes. In addition, Telstra provided special subsidies and discounts to certain social groups and organisations. A$203 million (US$172 million) of benefits were offered to low-income customers to help them pay for their communication services, A$0.6m (US$0.5 million), in "Seniors" grants were given to community organisations, and 114,000 charities and not-for-profit organisations received special discounted connection rates.[154]

Mobile operators are also involved in a number of environmental programmes. In 2008, dtac contributed to the 3-year long project with the Royal Thai Army to encourage reforestation in deteriorated forest areas; the goal of the initiative is to plant one million mangrove trees by 2012. In addition, dtac collaborated with the Border Patrol Police to install over 35,000 irrigation dams by the end of 2010[155], and also provides farmers with a free SMS/MMS-based agricultural database, the '1677 Farmer Information Superhighway'. This programme also has a network of 132 agriculture experts who provide free consulting services over the phone to the 200,000 farmers who have subscribed.[156] In Malaysia, Maxis staff and family members have planted 7,500 trees over the past 2 years. These efforts are part of Maxis's Green Initiative to eliminate 27,000 tonnes of CO2 emissions in 2011.[157]

Employees of mobile operators also contribute directly to society. The Tibet Mobile Telecommunications Company collected donations from its staff for Yushu earthquake victims.[158] In Pakistan, some Ufone employees volunteered for the 'Partner with Citizens' Foundation', where employees spend 10 weekends as mentors to the younger generation, giving insights and advice on the corporate world.[159] Additionally, employees of Huawei Australia have been working to support local community activities in the Solomon Islands, Vanuatu, and Fiji.[160]

The above examples are a selection of the various initiatives that the mobile sector is currently undertaking for the benefit of society and the environment. They illustrate the tangible benefits that the sector can bring in these areas, and the commitment that players right across the Asia Pacific region have to sustainable operations within their communities. Mobile operators could build on their current portfolio of CSR initiatives and involve themselves in more sensitive areas like: empowering women in Asia, reducing child pornography, and more directly addressing the energy conservation issue from a sustainability perspective rather than a cost savings perspective.

It is, arguably, in their "collateral" impact on society that mobile operators bring the greatest benefits, i.e. through the coverage and quality of connectivity that they can provide. The societal and economic gains achieved by communicating via the new array of mobile-based channels, by being able to use time more efficiency, and by having access to "information-at-your-fingertips" can be transformational, not only in terms of improving the quality of life for a country's citizens, but also in terms of transforming a country into a knowledge-based society through a virtuous circle of higher productivity, increased wealth and investment in innovation.

6. Regulation of the Asia Pacific Mobile Sector

Key Messages:

Effective regulatory policy making is potentially the most important influencer of growth in the mobile industry and the wider economy

Discussions with players within the ecosystem has identified five key regulatory themes for Asia Pacific:

- **Optimising spectrum allocation and licensing**
- **Driving effective taxation and deployment of Government funds**
- **Rebalancing regulatory frameworks to address new players in the growing mobile ecosystem**
- **Developing a sustainable model for mobile internet, by proactively addressing net neutrality concerns**
- **Allowing the market to address mobile data roaming**

Regulatory policy in these areas can benefit consumers, generate industry value and drive social development and economic growth

There is no questioning the importance of the role that regulators play in the mobile communications sector, and the impact that their actions have on the sector, its participants and its customers. As we will highlight in this chapter, there are numerous examples of regulators playing a pivotal enabling role in driving their goals of coverage, affordability and quality in mobile communications, and all the positive economic and social benefits that this brings to a country, and indeed Asia as a continent. Unfortunately there are also examples of regulatory policies having the opposite impact on these intended goals, to the detriment of all stakeholders in the mobile ecosystem, including the end-customers. There are lessons learned from both the positive and negative cases that need to be heeded by all Asian regulators if their policies are to be progressive and impactful.

As before in our 2009 study, a joint team of A.T. Kearney consultants and GSMA public policy specialists interviewed mobile operators from both emerging and developed markets in the region to assess the regional relevance and resulting impact of the different policy enablers. A consistent message from the interviews was that governments should focus on enabling progressive policy making in the following five areas:

- Optimising spectrum allocation and licensing
- Driving effective taxation and deployment of Government funds
- Rebalancing regulatory frameworks to address new players in the growing mobile ecosystem
- Developing a sustainable model for mobile internet, by proactively addressing net neutrality concerns
- Allowing the market to address mobile data roaming

6.1 Optimising Spectrum Allocation and Licensing

Spectrum management is among the most important issue for the telecoms industry globally. Spectrum is a valuable and limited public good – effectively a scarce natural resource – that governments control and need to best utilise to maximise economic and social benefits for their citizens. As shown in previous chapters, mobile technologies are the primary sources of communication for much of the population in Asia Pacific and mobile broadband is expected to be the critical technology that will finally bridge the digital divide and connect the unconnected across the region. However, for ubiquitous and seamless mobile communication and broadband to exist, for governments to tap into the economic value add of the industry, and for people to be able to benefit from the full range of voice and data services, sufficient spectrum must be allocated to the industry. To ensure a range of mobile services are provided, at the lowest possible cost and to allow consumers to use the widest selection of devices the mobile industry needs allocation of internationally harmonised frequency bands and implementation of internationally harmonised band plans.

The licensing and spectrum landscape across Asia Pacific to a certain extent differs along the lines of emerging and developed economies. In most developed and emerging markets, 3G spectrum licences have been available in the market for a number of years already. In these markets the take-up of 3G and mobile broadband (HSPA and EV-DO) and the corresponding rapid increase in data usage is putting pressure on the bandwidth available for operators to meet the needs of customers. Furthermore, in emerging markets, spectrum allocation ultimately impacts how many people will gain access to mobile connections.

Broadly speaking, there are four key factors related to spectrum management and its impact on the mobile industry's ability to deliver affordable and high-quality access and services to consumers:

- Access to the right 'type' of spectrum and to a right combination of frequency bands
- Access to sufficient spectrum
- Spectrum pricing
- Efficient, fair and transparent spectrum allocation processes

Access to the Right Spectrum

The 'type' of spectrum issued – or the frequency band where the spectrum is allocated – greatly affects mobile operators' ability to achieve ubiquitous population coverage in a cost-effective manner, particularly in rural areas, and their ability to meet increasing demands for high speed mobile data. The mobile industry must have access to internationally harmonised coverage bands and internationally harmonised capacity bands and each operator depends upon the right mix of coverage and capacity bands. The coverage band used in most countries currently is the 900 MHz band for GSM/HSPA and, in some countries, the 850 MHz band is used as a coverage band for HSPA/CDMA. The 1800 MHz capacity band is mostly utilised at present, although some countries use 1900 MHz band instead. Countries that have awarded spectrum for UMTS/HSPA predominantly use the 2100 MHz band.

The 2600 MHz band, often referred to as the '3G extension band', has been internationally allocated by ITU Radio Regulations and most countries have either already allocated this band for mobile or are currently in the process of making decisions towards allocations . The 2600 MHz band has become a key capacity band for deployment of LTE in dense urban environments.

Allocation of UHF 700/800 MHz spectrum to mobile should be the next step towards achieving mobile broadband for all. To enable take-up in rural areas and among citizens with lower income, governments should provide mobile operators with UHF spectrum which will reduce rollout costs, and ultimately, reduce prices to consumers. In most countries in Asia Pacific, the 700 MHz band (698-806 MHz) is most likely to be the harmonised solution for mobile in the UHF band.

Estimates carried out by SCF Associates shows that the cost of providing mobile broadband using the 700/800 MHz band is approximately 70% lower than providing the services based on 2100 MHz band. Australia is one example of the benefit of access to coverage spectrum. Telstra has been able to achieve a staggering 99% population coverage (in one of the world's most sparsely-populated geographies) for mobile broadband using HSPA+ technology and attributes much of the success to deploying its network in the 850 MHz spectrum frequency band.[161] Telstra estimates that an HSPA BTS using the 850 MHz band can achieve four times more coverage than the same BTS using the 2100 MHz band (the 3G standard in much of Europe and Asia).[162]

International harmonisation of frequency bands (or at least regional harmonisation if global harmonisation is not possible) of frequency bands is instrumental in achieving cost-effective roll-out of networks. There are also significant economies of scale in the production of radio equipment and handsets as harmonisation of technical specifications can result in up to 50% reduction in the cost of terminal manufacturing[163] as well as significant cost reductions in the manufacture of radio base station equipment. It also reduces harmful cross-border interference and helps facilitate international roaming. Harmonisation of frequency bands is especially important for emerging economies where affordability is the greatest barrier for access as it can drive down rollout costs and consumer pricing. In particular, the mobile industry needs allocation of internationally harmonised frequency bands and implementation of internationally harmonised band plans to ensure a range of mobile services are provided at the lowest possible cost and to allow consumers to use the widest selection of devices.

The Asia-Pacific Telecommunity (APT) has recommended to the ITU an APT harmonised band plan for the 700 MHz Digital Dividend, which consists of 45 MHz paired, with a 10 MHz centre gap. This band plan offers the largest amount of useable spectrum and has great potential for large-scale regional and inter-regional adoption. There is also very strong technical support for it internationally. It is envisaged that this plan will help drive significant economic growth in the region if widely adopted, which would enable benefit from economies of scale in both radio equipment and handset production.

Access to Sufficient Spectrum

The amount of spectrum issued to mobile operators determines their ability to deliver high-quality services to consumers and manage the bandwidth required to handle increasing traffic volume from the uptake of mobile internet services.

In most markets, the minimum amount of spectrum licensed to operators has been 2 blocks of 10 MHz (2x10) though in many markets licenses of 2x15 MHz of 2100 MHz spectrum exist. However, as mobile broadband take-up increases, LTE developments emerge, and users begin to experience the true power of an 'always connected' experience, 2x10 MHz or even 2x15 MHz will likely prove to be insufficient and larger blocks per operator will be required to meet consumer demands. Some markets have, however, not followed this approach. The 3G auction in India only issued 2x5 MHz to each operator, with each of the 22 geographical service areas only assigned three or four blocks of 5 MHz spectrum. Whilst one cause of this is part of the corresponding 3G spectrum having already been allocated to India's military, which has limited the amount available, improved advanced spectrum planning could have helped to mitigate this issue. In a country where mobile will be the primary vehicle for Internet and broadband adoption, this is creating a market structure that is both unlikely to be sustainable and hamper broadband uptake.

The issue with this strategy is that operators typically will reserve an entire 5 MHz block for the provision of voice services alone. In densely populated regions (like in many Asia Pacific countries) it is feasible that even one 5 MHz block reserved for voice services could suffer capacity constraints due to network congestion, especially during peak times. If this happens, providing mobile data services to the broader population is unlikely to occur. The unintended consequence of this phenomenon is that either operators will opt for offering very poor-quality services because their network load will be far over capacity; or operators will be enticed into reluctantly pricing their 3G and mobile broadband services such that only a very small portion of the population will be able to afford them. Regardless, neither outcome meets the needs of consumers.

The Digital Dividend

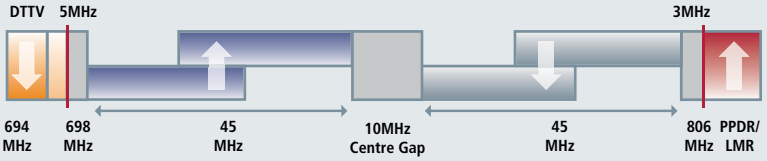
There is currently much discussion on the opportunities presented by the digital dividend. This term relates to the unprecedented amount of spectrum that is expected to become available as the transition from terrestrial to digital TV takes place. This event looms on the horizon for developed markets (e.g. Singapore, Australia) and some emerging markets (e.g. Malaysia). At the same time some countries in Asia (e.g. India and Pakistan) which have previously used the same spectrum, the UHF band, for other purposes are looking into allocating UHF spectrum to mobile.

The digital dividend spectrum is usually between 200 MHz and 1 GHz, which provides opportunities for the new recipients to significantly boost both their distance coverage and network capacity, but most importantly its characteristics allow it to transmit to a wide area using less infrastructure than other frequencies.

The digital dividend therefore poses both enormous opportunities and challenges for regulators. It is not every year that this much spectrum is freed up and made available to the market, and there is a wide range of sectors in the communication market clamouring to be given access to it. The correct approach is to distribute it fairly and transparently across the broadcasting, mobile communication and other ICT market segments in such a way as to maximise the social benefit. New Zealand is a good example where this has been pursued, with a distribution balance struck across mobile telecommunication, digital television and other ICT market segments.

It is, however, absolutely essential that sufficient harmonised UHF spectrum from the digital dividend is re-allocated to mobile technology for the industry to continue to deliver high-quality services (mobile broadband, in particular). The mobile industry argues that the promise of LTE can only be achieved if sufficient digital dividend spectrum is allocated to the industry. The GSMA is seeking 25% of digital dividend spectrum (at least 100 MHz of the 400 MHz expected to become available), a seemingly reasonable demand given the widespread economic and social benefits that can be generated from it.

The Asia-Pacific Telecommunity (APT) has recommended to the ITU an APT-harmonised band plan that consists of 45 MHz paired, with a 10 MHz centre gap (see below).



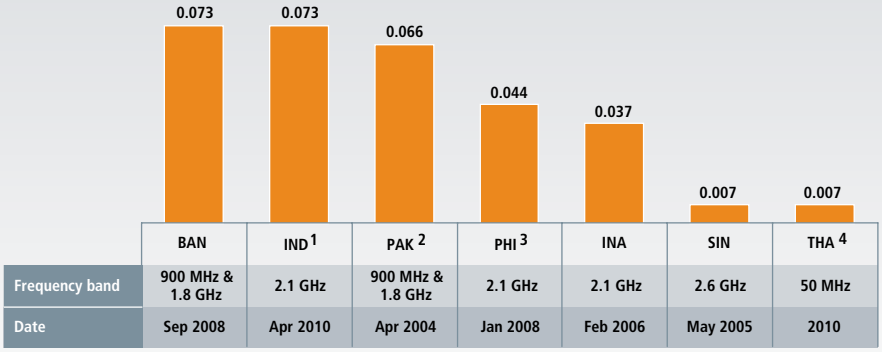
This band plan offers the largest amount of useable spectrum and has great potential for large-scale regional and inter-regional adoption. There is also very strong technical support for it internationally. It is envisaged that this plan will help drive significant economic growth in the region if widely adopted, which would enable benefit from economies of scale in both radio equipment and handset production.

Spectrum Pricing

The demand for, and limited supply of spectrum can tempt governments to drive high spectrum prices under the guise of maximising public good. However, the short-term goals of maximising revenue by governments desperately seeking a means of reducing their budget deficits are actually harmful to the development of the mobile sector. While in theory when an operator purchases spectrum, the costs can be considered as "sunk", in the real world mobile operators treat the price of spectrum as a true (recoverable) cost in their business cases. Consequently, this can then have adverse effects such as reducing CAPEX budgets allocated to other projects, such as rolling out networks, or increasing prices to recoup the spectrum costs. For example in the Indian 3G and 4G (BWA) licence auctions the auction approach raised over US$15 billion and certainly helped close the government's large fiscal deficit. However, it will also undoubtedly have a negative impact on the speed of rural deployment of mobile broadband services by limiting the capacity of the winning operators to invest in networks, leading them to prioritise the most concentrated urban areas.

These policies hamper network roll-out and the development of mobile services and thereby reduce the mobile sector's contribution to GDP growth. Moreover, governments could even find themselves eroding their net licence fees if they restrict the amount of bandwidth released and keep the price per MHz high. Despite this, there are significant pricing policy differences across Asia. Figure 44 highlights the large variation in spectrum pricing across Asia Pacific when considered on a cost-per-population-per-MHz basis.

Figure 44: Spectrum Pricing in Selected AP17 Countries[164] (US$/Population/MHz)



	BAN	IND [1]	PAK [2]	PHI [3]	INA	SIN	THA [4]
Frequency band	900 MHz & 1.8 GHz	2.1 GHz	900 MHz & 1.8 GHz	2.1 GHz	2.1 GHz	2.6 GHz	50 MHz
Date	Sep 2008	Apr 2010	Apr 2004	Jan 2008	Feb 2006	May 2005	2010

Note: (1) Based on Apr 2010 auction reserve prices
(2) Based on spectrum fees paid by new entrants, Warid and Telenor
(3) Based on "Supervision User Fees" received by the Philippines regulator
(4) Middle point of Citigroup spectrum cost estimates

Public discourse related to maximising public good from spectrum should therefore not be focused on how much money can be generated for public funds. Instead, it should be focused on how to maximise the overall economic and social returns from spectrum. As discussed in earlier chapters, there is a strong correlation between mobile penetration and both economic and social development. It follows that the value of spectrum to a country cannot simply be measured in terms of price per MHz, but rather needs to take into consideration the positive impact of readily available and affordable spectrum. Unreasonably high and irrational spectrum prices will ultimately be passed on to consumers, which will inhibit penetration growth and, ultimately, reduce the impact and value derived from the spectrum.

Spectrum award procedures

Governments should design and implement spectrum award procedures in an efficient, technology-neutral, fair and transparent manner to keep participant costs low and deliver usage benefits to citizens as quickly as possible. Lack of clarity around the spectrum award procedures can send mixed (and even negative) signals about the investment climate in a country.

There have been several examples in Asia Pacific where the spectrum award procedure has been unclear and thus inefficient. For example, in Bangladesh the 3G awards process has again been postponed until 2012 after a test run by Teletalk[165]. Also, Thailand is now the last remaining country in the ASEAN group without 3G services, with the auction not expected to take place until 2012 as policies presented by the National Telecommunications Commission (NTC) face strong opposition from labour unions at the two state telecoms enterprises.

Government policies should aim to develop a technology neutral environment (while ensuring interference is managed, and allowing the deployment of internationally harmonised spectrum plans). To facilitate innovation and a smooth technology development curve, governments should relax restrictions on the specific technology to be deployed so that, for example, a GSM operator can consider using its current spectrum for upgrading to third generation technology (UMTS/HSPA) or fourth generation technology (LTE). One might consider this as allowing operators to follow a natural upgrade path, and ensure that they are using the most cost-effective, and spectrally-efficient solutions.

Government policies should also be fair to all industry players. Implementing policies with the aim of ensuring one player (typically the state-owned incumbent) is given the advantage of going to market well before others, does not create a level playing field. For example, in India 3G licences and spectrum were awarded directly to the state-owned incumbents MTNL and BSNL up to two years ahead of an auction for the remaining licenses – thus giving them an unfair first-mover and spectrum advantage. It should be noted that India is not the only nation in the world to grant such advantages to their incumbent; similar cases have been seen in other countries. For example, in Thailand the state-owned operator is the only 2100 MHz licensee while other players in the market have not yet been given the opportunity to compete for 2100 MHz spectrum.

Over-licensing is a common occurrence as governments seek to maximise revenues from spectrum issuance and stimulate competition. India is a commonly-cited example but there are many others cases in Asia. For example, the Malaysian government has issued nine licenses of 2.6 GHz for the LTE network, despite there only being four mobile network operators in the country[166]. While this may have intended effect of creating a more competitive market, especially if the four WiMAX operators that received licenses use part of their spectrum to offer IP-based voice services, it remains to be seen first whether they will all invest in LTE and second whether they can all profitably operate an LTE network. It is imperative that the regulator adopts an open market policy and allows for market forces to take over as required through the consolidation of operators. Even if this runs against the original goal of increasing the number of market players, it is necessary to maximise the sector's effectiveness. Transparency is essential, for example clear rules are needed on what happens to spectrum and licenses during a merger or acquisition. Similarly, the regulator must allow for the sharing of network infrastructure, particularly because in many Asian countries the market is moving away from network coverage-based competition. Prohibiting network infrastructure-sharing is detrimental and results in wastage at market level, as operator capital is tied up in overlapping infrastructure instead of being put to better use deploying new network infrastructure in under-served areas.

Finally, preparing for spectrum awards and implementing and accomplishing award procedures should be carried out transparently, and preparations should include public consultations with market players. Investments in spectrum have long lead-times and thus require a high degree of certainty. Governments should realise that there are many ways to promote investment and attract bidders, including:

- Clarifying the regulatory framework
- Clarifying future spectrum availability, e.g. publishing a spectrum allocation and award roadmap of both the coverage bands (700, 800, 850 and 900 MHz bands) and the capacity bands (1800, 1900 if US band plan adopted, 2100 and 2600 MHz bands)
- Publicly committing to and actually implementing international harmonised band plans
- Clarifying the key technical and operational terms and conditions such as potential technology restrictions (e.g. GSM only) or potentially relaxing technology restrictions.

The Indonesian market has learnt a great deal from its own unclear spectrum allocation process in the past. In Indonesia, 3G licenses were awarded twice: the first time was in July 2003 and the second time in January 2006. The Chief Economics Minister went on record to say the government would repeat the tender for 3G licences, as the initial process of awarding the first two licences had been 'unfair'.[167] The first tender had resulted in two winners (Cyber Access Communications and Natrindo Telepon Selular) and neither player was even capable of rolling out a 3G network. Both players quickly sold the majority of their stakes to foreign investors, for a large profit. In September 2005, the regulator (DGPT) 'encouraged' CAC and Natrindo to each hand back 5 MHz of 3G spectrum frequency for reallocation in a re-tendering process that would involve the country's leading telecom operators. In February 2006, the Indonesian government awarded separate licences to Indosat, Excelcomindo and Telkomsel and subsequently halved the 3G spectrum allocated to Natrindo and Hutchison (formerly CAC) to create a "level playing field". While this is a good example of how not to run a transparent, efficient tendering process the learning has been good for the regulator, that has since run efficient auctions for spectrum allocation (such as the WiMAX auction in July 2009).[168]

As countries across Asia Pacific begin to consider re-farming (by either relaxing GSM-only restrictions, or by re-planning the use of UHF band previously used for terrestrial broadcasting and various public services) the principles of transparency and public consultations will become increasingly important.

It is worth noting that there are some examples of good practices, both in developed and emerging markets. In 2009 Australia, New Zealand and India all conducted public consultations in relation to spectrum management and usage, including the distribution of the digital dividend. In 2011, a public consultation discussion document was released by the New Zealand government on policies of the allocation of "digital dividend" 700 MHz radio spectrum with the purpose of seeking feedback from the public and interested parties to help inform recommendations to the government. In Singapore the IDA released a consultation paper to the market on net neutrality to help shape policy.[169]

Clearly, spectrum is fundamentally important for the success of the mobile industry. In economic terms it is an essential input; no spectrum means no networks, no services and no business. Spectrum is considered a vital factor for the mobile industry's ability to truly deliver affordable services to all. The objective of providing voice connections and internet access to all citizens cannot happen without ensuring the mobile industry receives sufficient amount of spectrum and the right combinations of coverage and capacity bands. As such, regulators are strongly encouraged to adopt the recommendations made above to allocate sufficient spectrum in the right frequency bands, priced to achieve maximum benefits for the economy and society as a whole, in an open and fair award process.

6.2 Driving Effective Taxation and Deployment of Government Funds

As illustrated throughout this paper, mobile telecommunication is an important engine for economic growth. In order to stimulate this growth, there is a need to further liberalise and reform telecoms policy in certain markets across the Asia Pacific region. The importance of driving both the population coverage of mobile services and their adoption has thus become even more pertinent. Key to this is ensuring that prices are affordable and do not act as an entry-barrier, particularly to those customers who are still on the wrong side of the "mobile digital divide", and in this context taxation is a key policy lever.

Mobile operators face a slew of charges including licence fees, spectrum usage charges, service taxes, USO, GST, etc. In addition to this, many countries in Asia Pacific have telecom-specific taxes that directly impact end-customers (see Figure 45). On the user-side alone, there are taxes for SIM cards, usage and activation. This poses two clear policy issues: (1) The impact of having such a plethora of diverse telecom-specific taxes and (2) the consumer impact of these taxes.

Figure 45: Examples of Telecom-specific Taxes in Asia Pacific

Country	Examples of Telecom-Specific Taxes (not exhaustive)
Bangladesh	■ 15% tax on general consumption (usage and services) ■ 12% duty on handsets (decreased from 25% in 2009/10 budget) ■ 100 Taka (~US$ 1.38) tax on handsets ■ 800 Taka (~US$11.03) tax for SIM activation ■ Corporation tax for telecom sector is 10% more than regular corporate tax ■ 5.5% "Revenue share tax" on MNOs
Pakistan	■ 19.5% VAT on mobile services (standard VAT is 16%) ■ 11.5% withholding excise on postpaid bill amount and on prepaid balance of calling cards ■ Rs 250 (~US$3) tax on handset imports ■ Rs 250 (~US$3) tax for SIM activation ■ $0.002 per SMS (introduced in 2009-10 Budget)
India	■ 1.06% tax on handset imports ■ $1.36 tax on SIMs ■ 10.3% VAT on mobile services
Sri Lanka	■ 20% special tax on connection and rental ■ 20% tax on usage rates ■ Additional taxes e.g. Environment Conservation Levy (2%) on mobile phones
Malaysia	■ 2.5% handset import duty ■ 6% GST on prepaid reload and SIM starter packs
Philippines	■ 10% handset import duty
Indonesia	■ 7.5% handset import duty
Thailand	■ 5% handset import duty

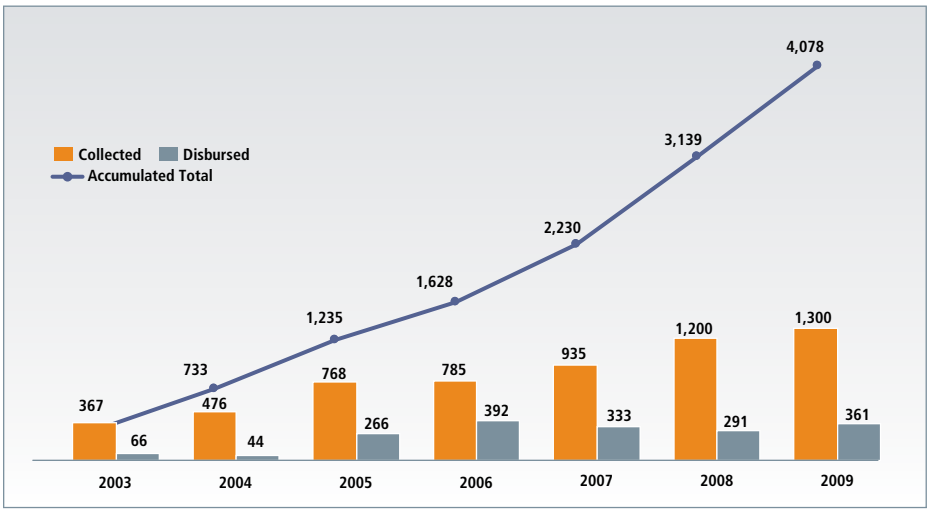
Having an array of telecom-specific taxes poses many issues. At a micro-level, these issues include administrative costs that both operators and regulators must incur to administer and process these taxes. At a macro-level this reduces price transparency in the market. For example the Bangladesh mobile sector is one of the most heavily taxed amongst developing nations, where no less than six different taxes are in place. These are a general consumption tax of 15% (on price per minute paid as well as subscription and connection costs), mobile handset specific taxes (US$11.03 on SIM card activation, US$1.38 on handsets and a 12% import duty per handset), corporation tax that is 10% higher than the standard rate and a 5.5% revenue-share tax.[170]

This brings us to our second issue – in the context of falling prices and mobile operator profitability (as described in Chapter 2), these taxes are mostly passed on to end-customers, thereby reducing price transparency in the market, and limiting the number of people who can afford connectivity. Taxation has been met with resistance by consumers in many markets. In Malaysia in 2011, the proposed 6% consumer-borne tax on prepaid reload and SIM starter packs was unsurprisingly ill-received by consumers. The tax has since been deferred following close discussions between the operators and the Ministry of Information, Communications and Culture.[171]

As well as ensuring that the taxation policy is not detrimental to mobile communication growth, operators need to optimise how the tax collected is then re-appropriated. One of the major recipients of telecom-specific taxes are Universal Service Funds (USF), the primary purpose of which is to spread communication access to all citizens. USFs typically work on a model where levies are collected from operators (mostly as a percentage of adjusted gross revenues) and are, in theory, redistributed as one-time subsidies in auctions to interested operators in order to fill the 'financial gap' required to make rollouts commercially viable. Regulators in many emerging countries have instituted USFs in order to subsidise increased universal access. In fact, ten of the AP17 countries currently have USF operator levies in place, including both emerging and developed markets – these are Australia, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Sri Lanka, Thailand and Vietnam.

USFs should be evaluated in terms of what proportion of the funds collected has been distributed, and the effectiveness of these distributions in achieving the goal of maximising access to communications. Unfortunately USFs are open to criticism on both fronts. In 2007, the GSMA released a study which showed that 74% of the monies collected through USFs in 15 developing countries had not been distributed. Three years on, similar issues continue to exist. For example in the Indian USF's inaugural year of 2003, US$367 million was collected but only US$66 was disbursed. Between 2003 and 2009, the USF pot has been growing but disbursements have not kept up (see Figure 46). By the end of 2009 a total of US$5.8 billion had been collected but only US$1.8 billon (around 30%) disbursed. This signals either that the USF levy on mobile operators of 5% of total revenues is too high or that the operators are making sufficient private investments to expand coverage to negate the need for complementary USF-funded projects. More broadly, it indicates that the overall system is currently ineffective.

Figure 46: USF Performance in India[172] (in US$ million)



As discussed in Chapter 3, mobile is fast becoming the primary communications channel in most Asia Pacific markets, especially in terms of providing access to voice and data services for the first time to previously unconnected parts of the population. It therefore follows that the mobile sector is where USF funds will have the greatest impact in bringing communication to all citizens. However, in most cases the fixed-line sector receives the lion's share of the funds generated, far in excess of the proportion of funds contributed by fixed-line. The 2007 GSMA Universal Access Report revealed that fixed line contribute 66% of the collections by USFs globally in that year, but received 93% of disbursements, while mobile contributed 34% but only received 5% of funds.[173]

Of course, that is not to say that USFs have not had an impact on driving mobile connectivity. In Malaysia, for example, USF funds are being used to increase Internet connectivity in rural areas[174]. At the end of 2010, the Malaysian Communications and Multimedia Commission (MCMC) reported a disbursement of MYR 4.2 billion (~US$ 1.3 billion) to eight projects, out of the MYR 4.6 billion in the fund. This is, however, unfortunately the exception to the rule and most collected funds are not deployed quickly enough or to the right places. Moreover, of the seven USF-funded projects in Malaysia in 2010, only one was mobile-related, despite this arguably being the channel that will have greatest impact on driving rural connectivity.[175]

The initiatives led by the mobile operators will arguably drive the connection of the hundreds of millions of APAC consumers who at the moment have access to neither fixed or mobile communications and the associated voice and data services that will transform their quality of life and upwards mobility, to the benefit of the country as a whole. The effectiveness of USFs as a means to achieve this is questionable based on their performance until now, however if they are to be used, is it not imperative that their funds be largely channelled to the mobile sector in order to realise these gains

Lessons Learned for USFs in Asia Pacific

Overall, the underperformance and lack of transparency of USFs in Asia Pacific and around the world begs the question of how governments and regulators should reform their USFs and what should be done with funds already collected but not yet distributed. Governments and regulators are urged to consider the following recommendations:

- USFs should have clear goals, targets, timelines and processes for both the collection and distribution of funds to ensure the transparency and measurement
- USFs should be reviewed on a regular basis and should be removed upon the achievement of the original goals
- Funds collected by USFs should be distributed in an open and consultative process involving industry stakeholders
- USF allocation policy should be on a least-cost technology basis that drives the highest population connectivity at the lowest cost
- USFs could be spent on infrastructure that could be shared among multiple players (such as towers and backhaul) to achieve greater efficiency of funds.

The vision to increase coverage, quality and population penetration of telecommunication is a shared one, pursued by governments, regulators and citizens, as well as mobile operators and the mobile ecosystem as a whole. More broadly, the importance of mobile communications to societal development and economic growth is unquestionable. Indeed, as noted at a telecom conference earlier this year, the mobile sector "is a vehicle to reach the benefits of the communication and information technology revolution. In order to do that, we cannot kill the goose that lays the golden egg"[176]. Progressive regulators recognise this and the importance of the ICT sector for economic growth, and therefore develop tax approaches to reflect this. For example, recognising the issues faced in the past, Malaysia's MCMC has now developed a "pro-ICT" tax approach that places the telecommunications sector at the heart of the national development agenda.[177]

However, the prevailing issue is that telecom taxation policies and USFs are not the optimal mechanisms to achieve this vision, and are in fact inhibiting rather than supporting its achievement. Indeed the GSMA estimates that in emerging countries reducing the tax impacting mobile broadband by US$1 generates additional GDP ranging between US$1.40 and US$12.60[178]. Instead of taxation and USFs regulators should be using innovative licensing approaches to drive up mobile coverage and penetration in under-served sections of their population. This could include issuing lower cost licenses for rural areas that have

a higher cost to serve but generate lower revenues per user, bundling licenses for high- and low-value parts of the country, or providing the subsidies needed for operators serving lower-value regions to break even. These practices have already been introduced in other sectors. For example in many countries postal services to rural areas are subsidised by the government, for example in the UK services to rural Scotland are subsidised to ensure a flat postage rate across the whole country[179]. A similar approach will encourage sustainable investment and innovation by mobile operators, and lower the barrier to entry for those Asians still on the wrong side of the mobile digital divide.

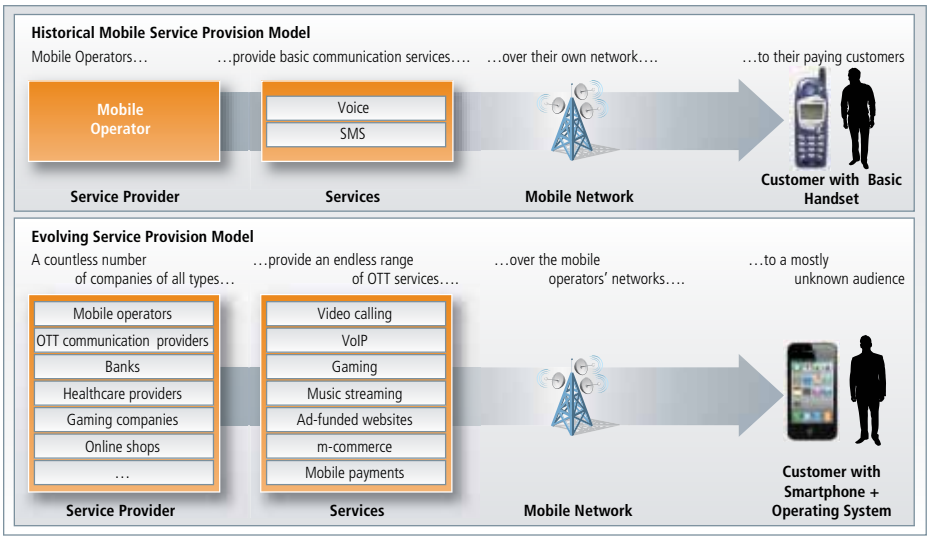
6.3 Rebalancing Regulatory Frameworks to Address New Players in the Mobile Ecosystem

With the deployment of high speed broadband across 3G and 4G networks, the mobile data ecosystem is expanding with an increasing breadth of company types, particularly around the provision of data services (as explained in Chapter 3). Besides the US giants like Facebook, Skype and Google, Asia Pacific has seen the emergence of their own online service providers that are increasingly targeting the mobile segment, like: Rakuten (the Japanese online shopping portal), Alibaba (the Chinese e-commerce provider that also recently launched a mobile payment solution), and Tencent (QQ) of China (instant messaging, wireless music store, and platform for mobile gaming). Beyond these data service providers, handset manufacturers and now smartphone operating system providers are also commanding huge influence as they control the interface for data service delivery.

It is clear that the old model where a mobile operator could deliver voice and SMS communication services to an end-user directly, via a simple handset is no longer pervasive. Today, new players are able to leverage the operators' networks to offer a wide range of communications services at a fraction of the cost. Today mobile operators are increasingly but one of many companies delivering a wide array of services via a range of devices, in competition not only with one another but also with other types of companies providing competing communication, entertainment and functional services over the operator's network (see Figure 47).

Overall, the market power of mobile data service providers, device manufacturers and operating system providers in the mobile sector is growing furiously, as are their revenues from mobile services. Despite this shifting landscape, the focus of telecom regulatory authorities firmly remains on mobile operators, while these new players are left largely unregulated. This situation needs to be redressed, both to ensure that major players in the mobile sector do not remain below the regulatory radar, and to bring transparency to the sector, which in turn will help stimulate investment and growth.

Figure 47: Evolution of Mobile Service Provision



As mobile data service usage evolves, the breadth of services requiring regulatory attention will expand. However, at present, there appears to be already three areas that require regulatory attention:

- Mobile health
- Communication services
- Mobile payments

Mobile health. Liability remains unclear in relation to many mobile data services, with mobile health as a prime case. Take the growing mobile health industry as an example, where patient lives are often at stake. Should treatment be unsatisfactory or counterproductive, either due to human error, connectivity issues or technology failure, it is not clear which party should take responsibility. Should the mobile operator be liable? What about the doctor, or the application provider, or the health workers, or even the health service provider themselves?

The issue of standards is another key consideration. At present, m-Health in Asia is loosely regulated, which is resulting in extensive innovation for the industry. However the absence of technology and interoperability standards is resulting in a plethora of standalone solutions that do not necessarily interconnect, especially when it comes to emerging technologies such as M2M where there remains an absence of standards on M2M SIM cards. This opaqueness risks limiting investment and adoption by end users, such as health authorities and hospitals.

Telecom regulators will need to cooperate with, for example, health, financial services and other sector regulators, to address this in a way that maximises growth and investment. A good example of this is in the US where the Food and Drug Administration (FDA) have released draft of guidelines designed to regulate mobile health applications.[180] The FDA will apply the same rigorous standards that have also created conditions for innovation and progress in the traditional pharmaceutical industry, creating a transparent, level playing field.

Communication services. The question of balancing public security with consumer privacy in communications and data protection is a further issue that has been much-discussed, and which is becoming increasingly relevant to the mobile sector as social media is increasingly consumed on handsets. On the one hand data centres owned and operated by players across the mobile ecosystem are storing personal data, including mobile data communication history and location information, which needs to be protected for privacy reasons. On the other hand, in some instances it may be in the public interest that these details be made accessible to third parties. For example the widespread use of mobile data traffic is argued to have contributed to terrorist activities in some Asian countries, leading some authorities to cite concerns on the use of certain services such as the encrypted BlackBerry messenger application.[181]

However, it is also important that regulators do not enforce restrictions for their own political gain, for example by infringing the privacy of political opposition parties. Greater transparency is required in this area, for the benefit of all players but most of all consumers. In addition regulators must recognise and reflect in their policies the fact that today mobile operators no longer have a monopoly on the communication services passing through their networks, yet the regulatory scrutiny until now remains firmly on those services that they provide.

Mobile payments. Like mobile health, mobile payment systems are increasingly playing a key role in the everyday lives of Asian citizens. However, also like m-Health there is a lack of transparency and common standards in this area. Mobile payments is subject to security breaches, which can potentially result in fraud or financial loss resulting for example from technology issues or negligence. Greater transparency in relation to liability would help to provide the increased market confidence amongst merchants and consumers required for mass rollout and adoption by these stakeholders.

The question of common standards is also relevant to mobile payments. Mobile payment services have been developed largely in a piecemeal manner. While this show of innovation across the sector is to be lauded, it also comes with problems, such as a resulting lack of confidence by the market on which solutions will become mass-market. This can be a major barrier to investment and adoption. As described in Chapter 3, in Singapore the Infocomm Development Authority took the lead in developing a common NFC mobile payment platform and defining common standards.[182] The benefit of this approach is that it is completely neutral to operators and data service providers, and therefore no player is in a position where it can potentially abuse its market position.

Overall, the growing market influence of players other than mobile operators, the lack of common standards and the lack of transparency in relation to customer protection clearly indicates that regulators need to review their focus. Mobile regulators need to create a regulatory environment that encompasses all players in the mobile data ecosystem, and balances the above issues and requirements with the need to maintain a pro-innovation approach, in a way that will allow the growth of mobile data services to continue while taking into consideration the interests of end consumers.

6.4 Developing a Sustainable Model for Mobile Internet, by Proactively Addressing Net Neutrality Concerns

The debate on net neutrality has been escalating in Europe and North America and is now beginning to become more pertinent in Asia, driven by the requirement for large-scale network infrastructure investments coupled with booming consumption of high-bandwidth services on both fixed-line and mobile networks.

This boom in data traffic is very much a global trend – total Internet traffic delivered via mobile networks is growing at over 100% per annum.[183] As cited earlier, in most developed Asian markets data now accounts for the majority of network traffic but only a small minority of revenues, despite the rapid decline in voice ARPM. This is in turn starting to have a severe impact on the profitability of mobile operators, as illustrated in Chapter 2, which in turn risks future investment in the networks required to deliver this traffic.

Net Neutrality: a brief overview

Net neutrality is based on the principle of an "open Internet", whereby there are no restrictions on the Internet-related content, platforms or equipment used by businesses and end consumers. Most importantly for mobile operators, net neutrality specifies that there should be no discrimination or prioritisation in terms of the delivery of content over their networks to Internet users. Although the debate initially focused on fixed-line Internet, the rapid growth of mobile Internet has led to net neutrality also being discussed in relation to mobile.

Those in favour of net neutrality cite the fact that the success of the Internet is due to its openness, and that any moves to allow traffic and content management by service providers will give them an undue advantage in the market at the expense of innovation and entrepreneurship.

In contrast, those opposing net neutrality cite the need for some traffic management and service differentiation for the simple reason that network capacity is limited, so this is in the best interests of all customers, particularly the vast majority who do not consume vast quantities of data services and risk experiencing a deterioration of service quality as a result of the activities of the minority who do.

Nevertheless, to cope with this demand the leading Asian mobile operators have until now been making billions of dollars in capital investments on deploying and upgrading their 3G and 4G networks, as detailed in Chapter 2, and investing in technology to manage the flow of traffic. Despite these impressive numbers, this alone is not likely to be enough to address the challenges faced. The massive growth in data traffic volume, initiated by data service providers that do not need to pay for the transmission of their content to customers, is putting these networks under unprecedented strain and threatening the viability of the entire system. The effects of this are starting to show, for example the elimination of unlimited data tariffs by many Asian mobile operators is an acute indicator of the growing pressures being faced by mobile operators' networks.

Many of the more developed Asian markets are therefore now at a critical point where the decisions of regulators will shape the future of mobile broadband and data services, while the developing markets can also see this situation on the horizon. Regulators are starting to recognise the need to act. For example the IDA's consultation paper in November 2010 on net neutrality sought to gauge the Singaporean market's view on the issues faced.[184]

Given the above facts, it is evident that a blanket application of the net neutrality principle cannot hope to lay the foundation for the future sustainable provision of data services over mobile networks. A.T. Kearney's recent report on the topic, "A Viable Future Model for the Internet", highlighted four potential models to be considered by regulators and policy-makers:

1. **Modification of retail pricing schemes.** Whereby the consumer pays, generally through volume based-pricing
2. **Traffic-dependent wholesale charges.** Where a traffic conveyance charge is payable by traffic senders at wholesale level based on the volume and timing of their traffic
3. **Enhanced quality of service over the public Internet.** With differential quality of service offered at a premium to certain data service providers
4. **Enhanced quality of service based on bilateral agreements.** With bilateral commercial agreements between network operators and data service providers.

Option 1 is already underway, with many Asian operators no longer offering "all-you-can-eat" data plans, or introducing usage caps. However the price increases required to fully fund the expected network capacity requirements in a world where average consumers are regularly watching mobile TV and streaming video on their handsets and unlikely to be feasibly given the competitiveness of the market. Critically, it would make mobile data services unaffordable to many low-income customers, thus depriving them of the extensive benefits outlined in this report.

Option 2 involves traffic senders paying the receiving network for the best-effort delivery of its traffic based on volume, with most of the funds being passed to the retail connectivity providers. This would require common agreement between stakeholders on the operating model and the pricing. Given the fact that much of the mobile data content originates from outside of the country of consumption, the huge global penetration of the likes of Facebook and Twitter amongst mobile users being prime examples, this could be difficult to implement in practice.

Options 3 and 4 allow for operators to offer differing quality of service or traffic prioritisation to be offered at a premium to certain mobile data service providers, in order to guarantee a certain quality of user experience. Option 3 involves a market consensus between players on service quality and pricing, while Option 4 is a more "free-market" approach where mobile network operators can enter into bilateral agreements with mobile data service providers, in parallel to the best-effort Internet services currently offered. This would enhance quality for end-users without the need to increase mobile data rates.

Overall, Options 3 and 4, whereby mobile operators are able to differentiate on quality of service and manage the traffic over their networks in accordance with commercial agreements that they have in place, is a highly-attractive option for all stakeholders, as long as it is conducted in a transparent and non-discriminatory manner. Consumers receive a superior experience in their mobile data services for the same (or lower) cost, operators are able to recoup their network investments without raising consumer prices and data service providers are able to guarantee the quality of their services. This network management and price differentiation can stimulate innovation and economic efficiency. Indeed the rapid growth in content delivery networks (CDNs) in Asia and the rest of the world is testament to the appetite for this type of business model.

A further benefit is the marginalisation of pirate file-sharing and online TV sites, which are amongst the highest consumers of traffic and are prevalent in many Asian markets. These sites would not be able to strike deals with network operators, which would put them at a disadvantage to legitimate online media sites offering the equivalent services.

Up to now, the mobile sector has delivered phenomenal social and economic returns to Asia, with data services promising the next wave of growth and benefits. For this positive trend to continue, regulators need to ensure fair value distribution between the players in the market. These players need to have the freedom and flexibility to optimise their business models as they see fit, including entering into bilateral deals in an open-market situation. Policy makers should defer to market forces and the highly competitive environment in Asian mobile markets that provides extensive choice to consumers, rather than seek to intervene or regulate on matters relating to network usage and pricing. Their role needs to be a supporting and enabling one, encouraging technology investment and commercial model innovation. In addition, it is imperative that spectrum allocation and operator licensing is conducted in a fair and transparent manner, such that the network is managed by those operators that are best positioned to innovate and deliver high-quality services to end-users.

6.5 Allowing Data Roaming Charges to Continue to be Actively Addressed by Operators

High data roaming rates have long been a topic of discussion across most of Asia, as well as around the world. While domestic mobile data costs have been steadily coming down in most Asian markets, data roaming costs have remained relatively high. There are a number of implications from high data roaming charges, including bill-shock (especially given the growing price difference between domestic and foreign data consumption), the acquisition of prepaid SIMs in foreign countries when travelling abroad, which can lead to artificially inflated subscriber figures and mobile penetration rates, and customers foregoing data services while abroad to avoid incurring high data roaming charges. As data services are growing and becoming more ubiquitous, providing key benefits to society as outlined in this paper, the ability of consumers to use these services seamlessly and at reasonable rates across borders is key to realising those benefits.

Data roaming rates have however been falling in recent years with the launch of new reduced-cost data roaming plans (see Figure 48). The primary reason for this is increasing data roaming volumes. Until recently, international data roaming volumes in Asia were too low for operators to be able to strike effective roaming agreements. This has, however, been changing rapidly, driven by the rapid growth in the range of services, 3G coverage and smartphone penetration – thereby driving prices down. This leads to a virtuous cycle where increasing data roaming volume allows operators to reduce prices, which in turn stimulates higher usage. Thus the sector is effectively self-regulating its data roaming rates.

Figure 48: Data Roaming Plan Examples[185]

Operator	Examples of decrease in data roaming prices
Telstra	■ 2008: Standard iPhone data roaming package at AU$15(~US$14)/MB ■ 2011: Standard data roaming package at AU$29(~US$26.70) per month, for up to 10MB of data **80% reduction in price per MB**
StarHub	■ 2007: Launched S$15 (US$11) capped daily data plan ■ 2011: Launched Starhub Roam Manager, at 10MB at S$30 (US$22)/month **A significantly lower priced data roaming option for the average data consumer**
Telkomsel	■ April 2011: Launched Bridge Data RoamUnlimited, unlimited data roaming for Rp100,000 (US$11)/day and up to Rp270,000(~US$30)/3 days ■ May 2011: Launched Unlimited BlackBerry Roaming, with BlackBerry data roaming for Rp50,000(US$5.50)/day, up to Rp140,000(~US$15.50)/3 days **Price reductions through both alliance and standalone tariffs**

Furthermore, the prevalence of operator alliances is helping to drive data roaming volume up and prices down by increasing transparency and reducing cost, for example through flexible unlimited data roaming packages. The Conexus, Asia Mobility Initiative (AMI) and Bridge Alliances together cover 28 Asian operators (see Figure 49), each alliance offering reduced roaming rates between the members. Similarly, mobile groups have reduced roaming rates for their customers that roam across the networks of their operating companies. For example Axiata launched its *Daily Unlimited Data Roaming* plan[186] in 2010 which capped data roaming rates across its networks in Malaysia, Singapore, Indonesia, Sri Lanka, Bangladesh and Cambodia, as well as Chunghwa in Taiwan and SoftBank in Japan.

As seen in Chapter 3, other operators have responded in a similar manner by offering comparable data roaming rates.[187] In early 2011, China Mobile, KT, and NTT DOCOMO signed a strategic framework agreement which includes the launch of a new unlimited data roaming package to subscribers in all three countries. In addition, there have been suggestions for the creation of a "Northeast Asia free roaming region" using the operators' Wi-Fi hotspots in each country to further benefit consumers.[188] Going one step further, the Conexus alliance has recently entered into a roaming alliance stretching beyond Asia with the Vodafone group.[189] Furthermore, there have been innovations in services to help users manage their data consumption to avoid "bill shock" resulting from high roaming costs. StarHub's Roam Manager allows its customers overseas to check roaming rates, check usage levels and set usage alerts.[190]

Figure 49: Asia Pacific Operator Alliances[191]

Alliance	Partners	
Asia Mobility Initiative Alliance	■ Celcom (Malaysia) ■ dtac (Thailand) ■ XL Axiata (Indonesia)	■ IDEA Cellular (India) ■ SmarTone (Hong Kong and Macau) ■ Sun Cellular (Philippines)
Bridge Alliance	■ Airtel (India) ■ AIS (Thailand) ■ CSL (Hong Kong) ■ CTM (Macau) ■ Globe (Philippines) ■ Maxis (Malaysia)	■ Optus (Australia) ■ Singtel (Singapore) ■ K Telecom (Korea) ■ Taiwan Mobile (Taiwan) ■ Telkomsel (Indonesia)
Conexus Alliance	■ BSNL (India) ■ MTNL (India) ■ FarEasTone (Taiwan) ■ Hutchison Telecom (Hong Kong) ■ Indosat (Indonesia) ■ KT (Korea)	■ NTT DOCOMO (Japan) ■ Smart (Philippines) ■ StarHub (Singapore) ■ True Move (Thailand) ■ Vinaphone (Vietnam)

As data roaming volumes continue to rise and operators continue to be proactive in striking deals amongst themselves to make data roaming more accessible and affordable to subscribers, regulators should adopt a more passive stance, allowing the market to determine the best outcomes. Their role should be an enabling one, supporting operators in their formation of these partnerships and ensuring that there are no road-blocks. Ultimately, the intensity of competition between operators – as evidenced by the bombardment of roaming-related advertisements in every Asian airport terminal – will ensure that roaming rates continue to fall.

7. Appendix: Mobile Broadband Readiness Index Methodology

7.1 Sources and Definitions

Mobile Environment

1. Mobile Penetration

Description: The number of active mobile phone numbers relative to a country's population
Source: Wireless Intelligence

2. Smartphone Penetration

Description: The number of Smartphone devices being used relative to a country's population
Source: Gartner

3. Mobile Broadband Penetration

Description: Mobile cellular subscriptions with access to data communications at broadband speeds, i.e. >1mbps
Source: Wireless Intelligence

4. 3G Population Coverage

Description: The percentage of the population within coverage of a 3G network (or networks of equivalent or greater speeds)
Source: Wireless Intelligence, A.T. Kearney Analysis

5. Maximum Access Speed

Description: A mobile network's maximum connection speed to the internet as measured in bits per second
Source: Wireless Intelligence, A.T. Kearney Analysis

E-Readiness

6. Fixed Line Broadband Penetration

Description: The number of fixed line broadband subscriptions relative to a country's population to indicate the country's experience in consuming high-bandwidth content
Source: ITU

7. # of Domains

Description: Total number of domains specific to a particular country that is accessible through the web as an indicator of the volume of local content available online
Source: Webhosting.info

Market Profile

8. Market Competitiveness (HHI)

Description: A measure of market concentration calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers – known as the Herfindahl-Hirschman Index. When converting the HHI score into a MBRI score of 100, a higher MBRIscore indicates higher market competitiveness, which is a driver of innovation in the quality of mobile broadband connectivity and service delivery
Source: Wireless Intelligence

Business Environment

9. Regulatory Environment

9.1 Regulatory Quality

Description: Index that captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development, which stimulates transparency and promotes long-term thinking and investment by players in the mobile ecosystem.
Source: World Bank, World Governance Indicators

9.2 Rule of Law Index

Description: Index that captures perceptions of the extent to which agents have confidence in, and abide by, the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, which provides essential market stability.
Source: World Bank, World Governance Indicators

9.3 Rigidity of Employment

Description: Average of 3 sub-indices: a difficulty of hiring index, a rigidity of hours index and a difficulty of redundancy index, which together facilitate operational flexibility, especially for SMEs that are particularly active in the development of mobile data services

Source: World Bank, Doing Business 2009; World Economic Forum, Global Competitiveness Report 2010-2011

10. Conditions for Business – Entrepreneurship

10.1 Time to Start a Business

Description: Measure that captures the median duration that incorporation lawyers indicate is necessary to complete a procedure with minimum follow-up with government agencies and no extra payments, which contributes to the speed of SME sector growth.

Source: World Bank, Doing Business 2009 and 2011

10.2 Cost to Start a Business

Description: Cost is recorded as a percentage of the economy's income per capita. It includes all official fees and fees for legal or professional services if such services are required by law. Fees for purchasing and legalizing company books are included if these transactions are required by law. The company law, the commercial code and specific regulations and fee schedules are used as sources for calculating costs. In the absence of fee schedules, a government officer's estimate is taken as an official source. In the absence of a government officer's estimate, estimates of incorporation lawyers are used. If several incorporation lawyers provide different estimates, the median reported value is applied. In all cases the cost excludes bribes. This cost is a contributing factor to the ease of starting a business.

Source: World Bank, Doing Business 2009 and 2011

10.3 Minimum Capital (% of income per capita)

Description: The paid-in minimum capital requirement reflects the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation and is recorded as a percentage of the economy's income per capita. This can act as an enabler or a barrier to entrepreneurs in the mobile sector.

Source: World Bank, Doing Business 2009 and 2011

Technology Environment

11. Innovation Environment

Description: Based on the 12th pillar of the World Economic Forum's Global Competitiveness Index, this metric takes into account (a) Capacity for innovation (b) Quality of scientific research institutions (c) Company spending on R&D (d) University-industry collaboration in R&D (e) Government procurement of advanced technology products (f) Availability of scientists and engineers and (g) Utility patents.

Source: World Economic Forum, Global Competitiveness Index 2008-2009 and 2010-2011

12. Business Use of Internet

12.1 Availability of Latest Technology

Description: The extent to which the latest technologies are available in a country

Source: World Economic Forum, Global Competitiveness Index 2008-2009 and 2010-2011

12.2 Firm-Level Technology Absorption

Description: The extent to which businesses in a country have absorbed new technology, which provides a sound platform for mobile broadband and data growth

Source: World Economic Forum, Global Competitiveness Index 2008-2009 and 2010-2011

12.3 FDI and Technology Transfer

Description: The extent to which foreign direct investment (FDI) brings new technology into a country

Source: World Economic Forum, Global Competitiveness Index 2008-2009 and 2010-2011

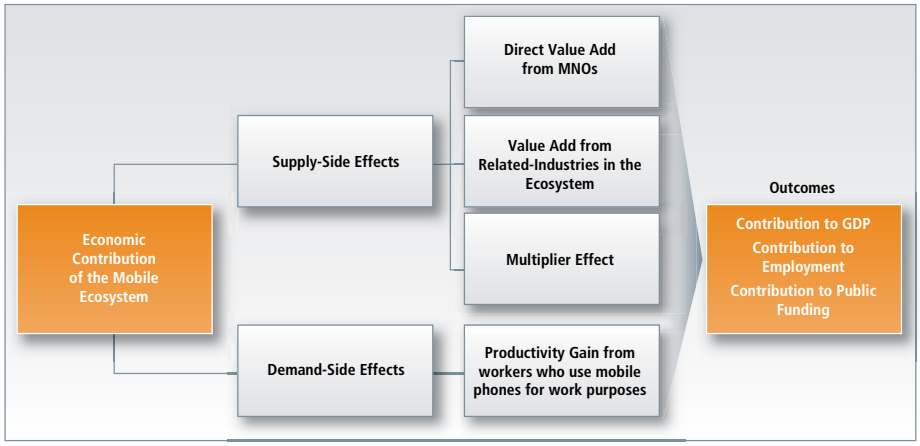
13. Government Use of ICT	
13.1 Governments Online Service	
Description	A composite measurement of the capacity and willingness of countries to use e-government for ICT-led development. E-Government Development Index is a composite index comprising the Web measure index, the Telecommunication Infrastructure index and the Human Capital index. E-government is defined as the use of ICT and its application by the government for the provision of information and public services to the people. High Government adoption of technology, including mobile platforms, to deliver services provides can be a key driver for wider adoption by consumers and businesses. Taiwan and Hong Kong are not scored on this metric.
Source	United Nations Public Administration Network, e-Government Develoment Database (UNeGovDD) (http://www2.unpan.org/egovkb/)
13.2 Online Participation	
Description	The United Nations E-Participation Index is based on the survey used for the UN Online Service Index. The survey measures the quality and usefulness of information and services provided by a country for the purpose of engaging its citizens in public policy making through the use of e-government programs. More specifically, the index measures G2C on 3 levels: (a) e-information sharing with citizens (b) e-consultation with citizens for deliberate and participatory processes, and (c) e-decision making on citizen input in decision-making. Taiwan and Hong Kong are not scored on this metric.
Source	United Nations Public Administration Network, e-Government Development Database (UNeGovDD) (http://www2.unpan.org/egovkb/)

7.2 Scoring Methodology

Scoring for each the metrics was determined by using linear proportionality where the maximum value for any given metric gets a score of '100', the minimum value gets a score of '0', and all remaining values are scored linearly relative to the maximum and minimum scores. The 2011 index is based on 2010 data, while the 2009 index is based on 2008 data.

8. Appendix: Economic Contribution Methodology

Framework for Calculating the Mobile Ecosystem's Economic Contribution[192]



To determine the mobile ecosystem's supply-side effects on the economy, the economic value add[xiv] of MNOs and adjacent industries in the ecosystem (for instance, content and services, distribution, and device manufacturing) was estimated based on proxy companies across the value chain in various AP17 countries. A multiplier[xv] was then applied to the direct contribution of the mobile ecosystem to estimate its impact on other industries. On the supply-side, total contribution to employment consists of direct employment, indirect employment, and the multiplier effect. Direct employment refers to employment specifically from mobile operators whereas indirect employment refers to employment generated in the related industries of infrastructure, content and services, distribution, and device manufacturing.

However, as mobile devices become a daily tenet of the mobile-enabled working population's everyday lives, the potential for improvement in overall productivity needed to be accounted for. Thus, the percentage of mobile workers in each country's workforce[xvi] and their average GDP contribution was estimated (total GDP divided by total workforce) and multiplied by an estimated productivity gain from mobile usage. The productivity gain factor used was approximately 4% for developed countries and 7.6% for emerging countries based on a range of percentages used in previous studies (5-10%).

A lower productivity gain percentage was used for developed countries based on the fact that, in emerging countries, mobile phones are often the only form of communication, and thus, without mobile phones workers in the developing world would be significantly worse off than their counterparts in developed countries who typically have access to fixed line access in the office, at home and out of home.

The potential increase to each country's GDP is calculated based on target penetration rates. Targets were set based on two factors – whether a country is a developing or developed market, and the 2010 connectivity level. The basis of this is a 2009 World Bank report stating that 10% increase in mobile penetration rate has the potential to incur a 0.60% GDP increase for high income economies, and a 0.81% increase in GDP for low middle-income economies.

Target penetration rates were set with the assumption that after a country had achieved 100% penetration, its potential GDP uplift from further increases to mobile penetration would continue to increase, but at a diminishing rate. This is because once everyone in a country is connected, the marginal impact on GDP from further connectivity as people acquire second or third SIMs is lower than in the case of someone acquiring their first SIM. Some of the AP17 countries are evidently multi-SIM markets, resulting in a high penetration rate for a relatively underdeveloped market. For example, Vietnam has a penetration rate of 126% despite being an emerging market, which suggests that a large number of people have several SIM cards but many do not have any. For these markets, a higher target was set to account for the heavily multi-SIM environment. The difference between these targets and actual penetration was used to derive the potential GDP uplift, that is, the amount of incremental GDP a country could achieve through attaining the target level of connectivity.

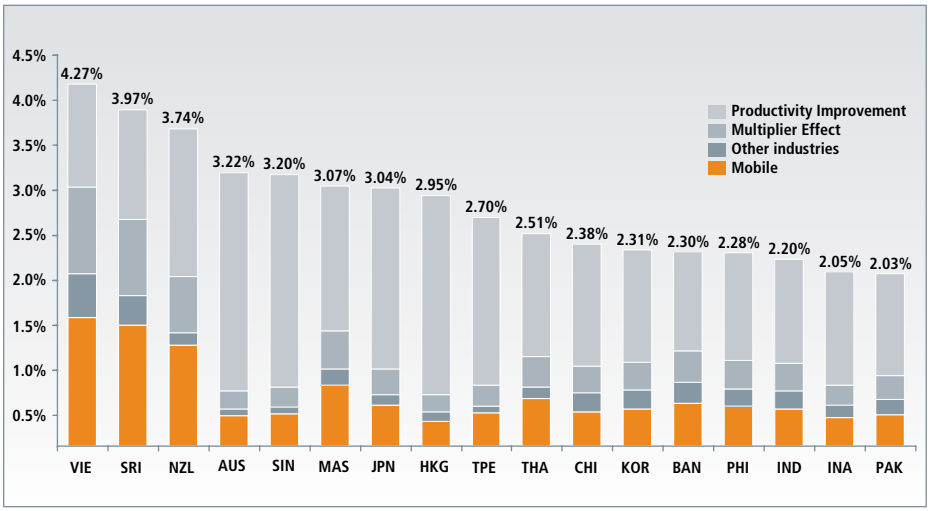
xiv Value add was used rather than revenues in order to avoid double counting of revenue flows within the value chain. Value add = EBIT + Wages – CAPEX + Depreciation or approximately Revenues – Cost of Sales.

xv We used 1.5 as a multiplier based on an average of multipliers used in other studies, ranging from 1.1 to 2.0, such studies including the Deloitte-Telenor Economic Impact of Mobile Communications in Serbia, Ukraine, Malaysia, Thailand, Bangladesh and Pakistan report.

xvi To assess the percentage of mobile workers in the economy, we leveraged various studies including studies conducted for Telenor ASA and IDC.To determine the % of mobile workforce across AP17 countries, we correlated the GDP per Capita (at PPP) to the % of mobile workers for selected countries. Subsequently, we linearly interpolated the missing country data that was not available. While it can be argued that GDP per Capita and mobile workers % may be partially interrelated, it is probable that they are not fully dependent upon each other.

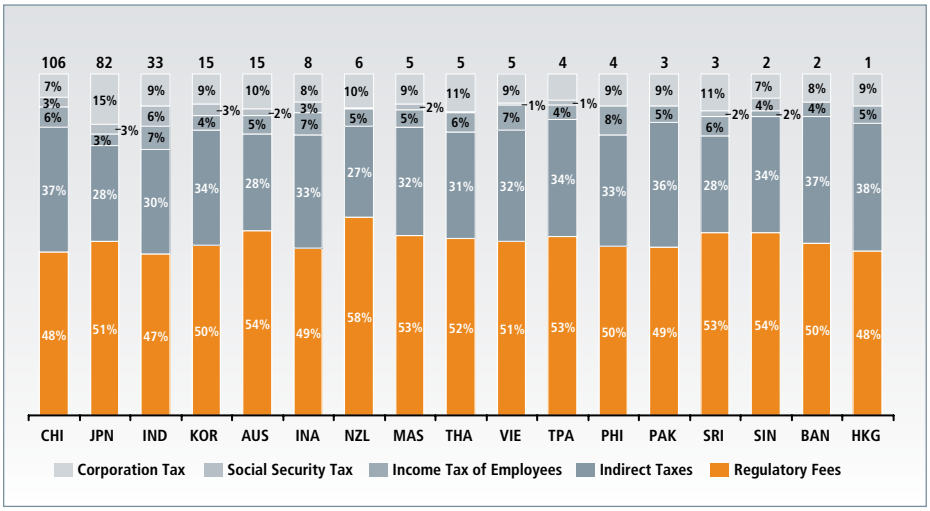
9. Appendix: Country-Level Economic Contribution Estimates in AP17

9.1 Mobile Ecosystem Value Add in AP17 by Country (Value Add as a % of GDP, 2010)



9.2 Employment Created by the Mobile Ecosystem in AP17 ('000 Employees, 2010)

9.3 AP17: Mobile Industry Contribution to Public Funding by Country (US$ Billion)



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The second Asian Pacific Mobile Observatory was a joint research study between the GSMA, A.T. Kearney and Wireless Intelligence.

Any questions on the content of this document can be directed to the authors of the study.

About the GSMA

The GSMA represents the interests of mobile operators worldwide. Spanning more than 220 countries, the GSMA unites nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, Internet companies, and media and entertainment organisations. The GSMA also produces industry-leading events such as the Mobile World Congress and Mobile Asia Congress.

For more information, please visit Mobile World Live, the online portal for the mobile communications industry, at **www.mobileworldlive.com** or the GSMA corporate website at **www.gsmworld.com.**

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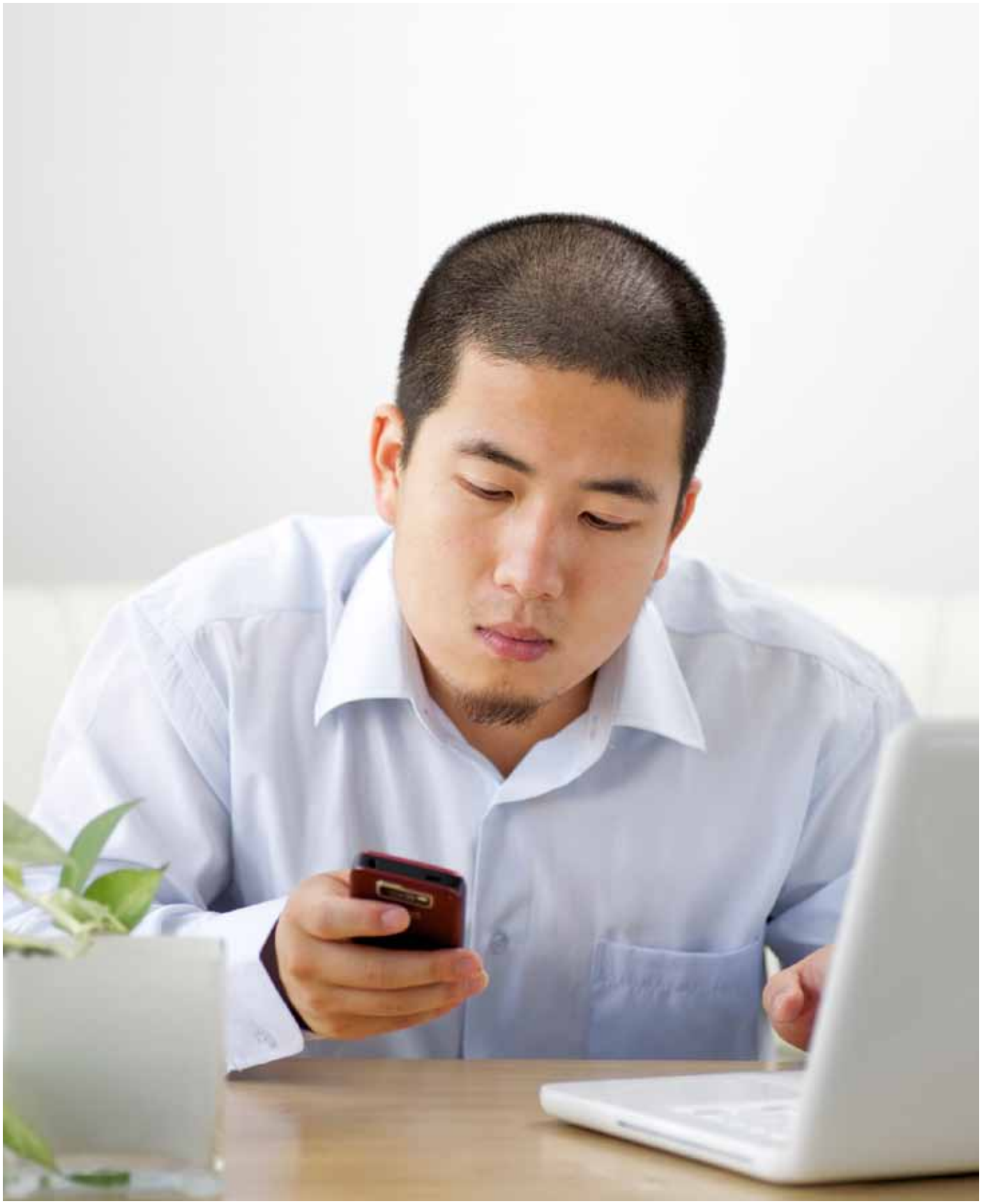

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