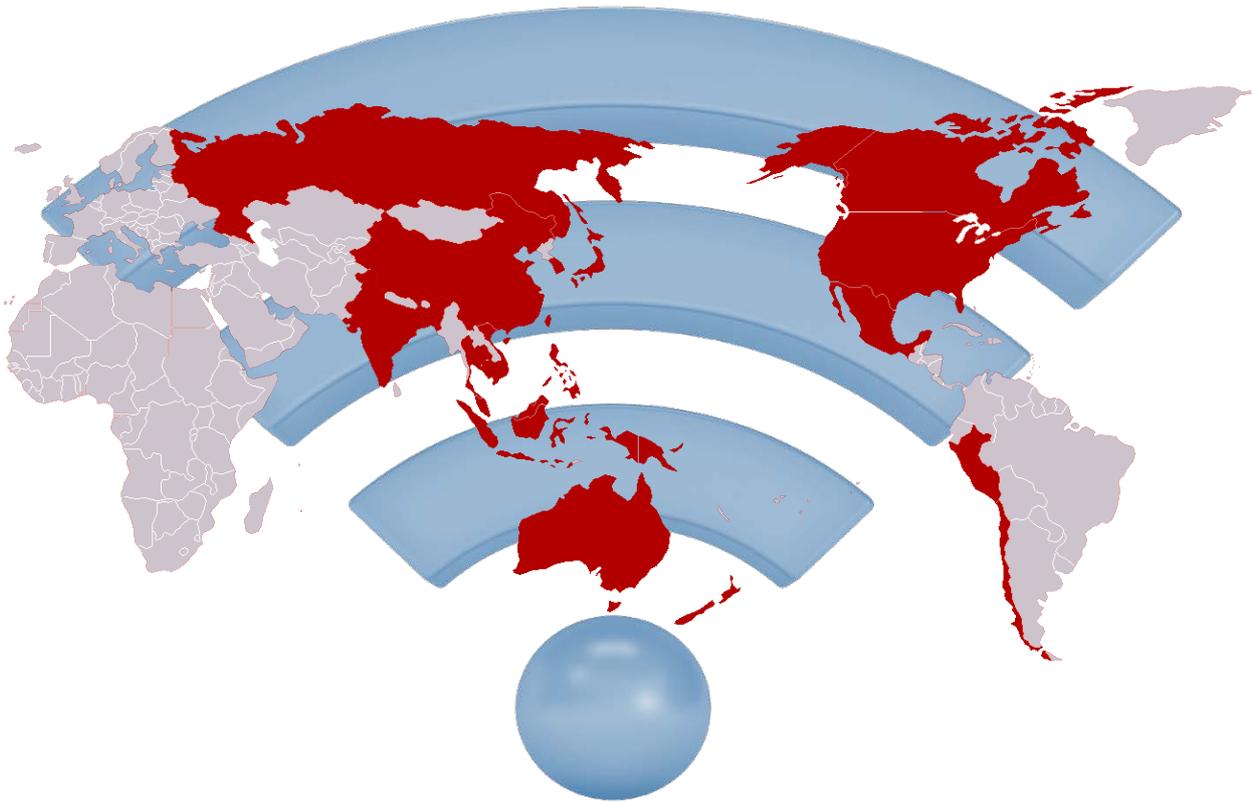


# Public Wi-Fi

Emergent urban infrastructure  
in the Asia Pacific and South Asia



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# Executive Summary

## Overview

Public wi-fi, the provision of internet connectivity in public areas using Wi-Fi™ wireless local area network technology operating in generally unlicensed radiofrequency spectrum, is emerging as a key part of the urban communications ecology. While the twenty four APEC+ economies<sup>1</sup> covered in this report make up a broad typology of public wi-fi provision, our research suggests that overall investment in wi-fi provision is increasing, and forecasts of mobile data usage suggest continued demand pressures.

Wi-fi is a localised technology, and, for reasons elaborated in this report, city governments or local government authorities are the most effective level of government to oversee its provision. However public Wi-fi provision is embedded in national and international regulatory systems, and connected with global flows of people, information, technology and capital. These systems are major determinants of local-level investment decisions and business models.

Analysing public wi-fi as urban infrastructure across the APEC+ economies, then, requires a multi-scalar approach as well as a multi-lateral one. Local investment decisions are nested within state (provincial) or national telecommunications policies, micro-economic settings, urban development policies and, where they exist, digital ICT policy frameworks. These settings are in turn nested within the regulatory frameworks of supra-national bodies such as the International Telecommunications Union, and multi-lateral initiatives to foster trade and development.

Ironically, though, the cheap and accessible nature of wi-fi technology, and its operation within a band of radio spectrum reserved for low-power, generally unlicensed uses, means that wi-fi is also an arena for experimentation and tactical deployment. The motivations of ‘bottom-up’ providers such as wireless activists, civic groups and not-for-profit organisations, may be similarly multi-scalar: from addressing hyper-local connectivity issues to preserving an internet commons.

Perhaps no other form of urban infrastructure exhibits this level of complexity. In undertaking the tasks of information discovery and analysing our research data, we have attended to the broader regulatory, policy and economic contexts that shape public wi-fi provision, to the business models through which public wi-fi operates as an increasingly indispensable part of urban infrastructure, and to vernacular and situated examples of experimentation, jerry-rigging and technological work-arounds that speak to distinctive social and economic conditions of APEC+ economies.

The country reports contained in this document attest to the patchy (if generally expanding) levels of public wi-fi provision across the APEC+ network, as well as the difficulty of information discovery. While in some cases, information discovery has been hampered by language limitations, the localised and sometimes informal nature of public wi-fi networks means that there may be little interest in documenting them for a wider audience. With little published academic or policy information on public wi-fi provision in the APEC+ economies, our research methodology focussed on general, business and technology-focussed media as the most comprehensive sources of in-country information. Although our contextual discussion attempts to overcome the limitations of a point-in-time analysis, rapid change in this field inevitably challenges claims to currency. In this light, we suggest that UIN may wish to circulate this report to APEC member economies to comment on their country profile and gather additional in-country information to supplement it. This process could be easily facilitated, and kept current, through a web portal.

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<sup>1</sup> The 21 APEC economies plus India, Bangladesh and Cambodia.

## Key Findings

- (1) Public wi-fi is increasingly viewed as essential infrastructure, and city governments or local government authorities are the most effective level of government to oversee its provision.
- (2) Almost all economies surveyed displayed some evidence of public wi-fi investment, although the level of activity varies significantly and data limitations preclude a complete comparative analysis.
- (3) Mobile data forecasts suggest continuing rapid and significant growth, driven by video data. Liberalised and cooperative regulatory and technical development frameworks are assisting this growth.
- (4) The characteristics of public wi-fi are fluid, with new business models and seamless network handover increasingly blurring the lines between public and private.
- (5) Network design and business models have shifted from ambitious indoor-outdoor blanket urban coverage, to largely outdoor provisioning in high-demand areas, with 3G and 4G services providing infill coverage.
- (6) Governments have a competitive advantage in facilitating public wi-fi developments through control or ownership of a distributed physical infrastructure (e.g. light poles) suitable for mounting wi-fi access points.
- (7) Governments are increasingly looking to private partners for provision and operation of public wi-fi networks on a low or neutral cost basis. Partnership arrangements can be complex and poor contract assessment and due diligence has resulted in some inappropriate government investment decisions in the field.
- (8) A range of rationales for public wi-fi network investment are advanced by governments, including tourist industry support, digital inclusion, e-government service access, local economic development (including fostering innovation and digital entrepreneurship), securing inter-city competitive advantage, public safety, urban management, reduced telecommunication congestion and resultant quality of service improvements.
- (9) Little research has been conducted on the investment returns or outcomes of public wi-fi networks in relation to the array of rationales advanced.
- (10) While city governments promote public wi-fi as urban infrastructure of the twenty-first century, there is limited evidence on the role public wi-fi plays in urban management. There are research and knowledge gaps in this area.
- (11) There is limited evidence that public wi-fi services have contributed to emergency management, response and recovery. This is also an area where there has been limited research and documentation.
- (12) The provision of public wi-fi is likely to play an increasingly important role in bridging digital divides in association with the broad diffusion of wi-fi and internet-enabled mobile devices.
- (13) Mobile network operators are increasingly offering a wi-fi service to public, business and individual customers to gain market share.
- (14) Revenue generation from wi-fi networks is focussing around advertising and location-based analytics.
- (15) Wholesale carrier wi-fi provision is emerging as a new commercial market as mobile network operators seek access to networks onto which they can re-route customer data away from their congested and higher-provision-cost 3G networks.

## Key Themes

### *Telecommunications Policy and Regulatory Settings*

**Competitive telecommunications markets operate in most APEC+ economies.** Market liberalisation of telecommunications is evident throughout the APEC+ network, with the exception of PRC and Bangladesh, which have introduced limited market competition. Competition is restricted in several countries due to the dominance of major telcos, in some cases the privatised public monopoly. Several countries (India, New Zealand) have retained public monopoly of parts of their telecommunications infrastructure (e.g. satellite services, broadband network). All countries examined have national telecommunications regulators. Singapore is widely regarded as a regional leader in regulatory and market settings, and there is evidence that other countries (e.g. India) are looking to emulate these. A lack of current data for Brunei, Indonesia and Papua New Guinea precludes a comprehensive regional market structure comparison.

### *Provision*

**Wi-fi is emerging as a key component of urban communications ecology across the APEC+ network,** with all economies, with the exception of Cambodia, displaying some evidence of public wi-fi investment. While public wi-fi provision is increasing, it is very uneven throughout the region. For instance, there is little evidence of network development in Bangladesh, Brunei and Peru, whereas numerous city and regional governments in India and Australia have recently announced extensive free networks in central business districts and on public transport, while extensive networks have been in place in Singapore, Taiwan and South Korea for some time.

**There are diverse policy rationales for public wi-fi provision across member economies.** A number of APEC+ economies have incorporated public wi-fi provision within national digital strategies, evidencing the growing profile and provision of this technology (for example, see Chile, Mexico, Bangladesh, Japan). A wide range of specific rationales for public investment in wi-fi provision are advanced in APEC+ economies including: economic development through promotion of the digital economy and/or inter-city competition (Chile, Philippines, Hong Kong, India, New Zealand), tourism (Japan, Hong Kong), e-government service access (India, Bangladesh), democratic participation (Philippines), and narrowing digital divides (Bangladesh, Malaysia, Chile, Japan, Mexico).

**Public wi-fi provision is closely oversighted by higher governments and courts.** While the litigious environment that has surrounded public wi-fi has moderated, several country profiles (most notably, the USA and India) show evidence of continued scrutiny by higher governments and courts to enforce competition and contract standards. Poor contract design may hinder public-private partnerships: the India country profile provides evidence that lack of contract specificity may halt PPP developments.

### *Technical Parameters and Business Models*

**Wi-fi has defining technical and regulatory characteristics that has made it an arena for experimental and tactical deployment – particularly with regards to public provision.** Wi-fi uses generally unlicensed (free) spectrum in the 2.4GHZ and 5GHZ bands. As a result of the unlicensed regulation of these bands wi-fi is subject to interference from competing uses. To limit interference wi-fi transmission is limited to very low power – generating a range of 50-100 m. The free and unregulated nature of spectrum has led to widespread incorporation of wi-fi receiver technology in electronic devices and to experimentation in network development. Public wi-fi networks initially followed a hub and spoke model (relying on substantial wired backhaul) and access points (APs) were described as hotspots. Advances in APs have enabled the formation of mesh networks with APs connecting to each other as well as end use devices, mitigating the need for each AP to have wired network access and facilitating automatic handoff between APs in the mesh to provide users a roaming service. New IEEE standards will further enable

automatic handoff between wi-fi and 3G networks providing a seamless roaming wireless experience using multiple network technologies.

**Public wi-fi provision models are evolving rapidly.** The increasing range of providers, from commercial (such as, Australia's Telstra Air service), to community (such as, India's Tilla Shahbazpur village network), and complex public-private partnerships (such as, Singapore's Wireless@SG) challenge conventional notions of 'public' as provided and owned by governments. In addition, provision of network access to the public in privatised public space, such as shopping malls and sports stadiums, has also complicated notions of public provision.

**City governments have a competitive advantage in wi-fi provision.** Control or ownership of distributed physical infrastructure (e.g. utility poles, street lights, bus shelters, buildings etc.) facilitates deployment of the large number of access points (APs) required to create effective mesh networks. This makes government an excellent network developer or low transaction cost partner for commercial network developers. In addition to fixed infrastructure we are also seeing experimental use of city government vehicle fleets as wi-fi access points for public use as well as urban management purposes.

**There is evidence that some government infrastructure has been underutilised as sites of public internet provision.** Notwithstanding the above point, evidence from the International Telecommunications Union and Universal Postal Union suggests that public libraries and post offices under-provide public internet access. This situation is not confined to developing economies, but prevails in advanced economies such as Australia.

**Governments are looking to alternatives to public funding of urban wi-fi networks.** While inconsistent and disaggregated data limit the capacity to quantify this finding, there is clear evidence of a trend for governments to contribute to initial capital costs, but to seek cost-neutral arrangements for the ongoing operation of public wi-fi networks. The most common mechanism for this is through partnership with a MNO, but more complex partnerships have also emerged that engage multiple commercial partners and multiple levels of government (for instance national and local, e.g. Chile).

**Provisioning models have evolved and matured.** Early ambitions of city governments for blanket indoor and outdoor network coverage (in some US cities, for example) have been scaled back to focus on provision in high-demand and high-value areas, with commercial mobile services providing infill.

**There are revenue pressures on commercial providers.** Current private investment strategy is typically related to differentiation and customer retention rather than direct revenue generation. The average number of revenue streams that operators use to monetise public Wi-fi networks fell between 2013 and 2015. Few commercial operators are now charging subscribers directly for wi-fi network access, although wholesale network access is emerging as a new market with operators charging mobile network operators to access their networks to re-route customer data away from congested and higher-provision-cost 3G networks. There are also cases where Telcos will initiate a public wi-fi service as free promotion before seeking to monetise it by offering it only to existing mobile network or home broadband subscribers (both Indonesia's Indosat Super Wi-fi and Australia's Telstra Air services were launched in this way). At a retail level advertising and proximity marketing and location-based analytics are common business models. Proximity marketing might include sending alerts or coupons to the devices of customers as they enter a shopping district, store or even a particular part of the store. Wi-fi is particularly suited to this application because of its limited range (Bangalore in India is exploring such commercial opportunities as the current government funded model looks unworkable). Data analytics involves provision of location based user data to venue operators or third-party marketers. One example of this is the Purple wi-fi tool used by Telstra in Australia.

**Universal Service Obligation Funds may also provide resources for public wi-fi network development.**

Universal Service Funds operate in a number of APEC+ countries (e.g. India: *Universal Service Obligation Fund*; Taiwan: *Universal Service Fund*; USA: *Universal Service Fund*). These funds require telcos to allocate a designated portion of their net earnings to the fund to expand service provision. While universal service funds generally prioritize coverage for regions and/or populations without access to voice telephony (traditionally provided over fixed lines and public pay phones), many countries are now expanding definitions to include mobile telephony and internet access.

**Use**

**Demand for mobile data will continue to increase.** Forecasts of data downloads by mobile devices suggest continuing exponential rates of increase, principally through increased video streaming. This is likely to place increasing congestion pressure on commercial networks, and increase the value proposition for commercial telco to partner with city governments for offload onto public wi-fi networks.

**Consumers are sensitive about advertisement exposure and data sharing:** While advertising-led business models are common (see Peru country profile), there is evidence that poorly designed approaches to advertising and data sharing generate consumer resistance. Consumers are also sensitive to quality of service issues, leading some major cities in APEC economies (e.g. San Francisco) to withdraw services rather than suffer reputational risk.

**There is limited evidence of the contribution of public wi-fi to emergency management and recovery.**

Two well-documented examples from the USA (Hurricanes Katrina and Sandy) indicate that public wi-fi networks were the only surviving telecommunication services.

**Evaluation**

**There has been little robust evaluation of public wi-fi provision.** Evaluation of the social and economic benefits of public wi-fi investment has significant methodological challenges. Available evaluation studies of networks in APEC+ countries generally paint a positive picture, but suffer from weak research design and data limitations.

# Methodology

An electronic search methodology was used in the composition of this report.

## SEARCH TERMS

- Researchers conducted an extensive online search using the framing terms ‘community wifi’, ‘community wi-fi’, ‘public wi-fi’ and ‘public wifi’ in combination with the names of the 24 APEC+ economies as well as broader regional terms such as ‘APEC’, ‘ASEAN’ and ‘Asia Pacific’.

## SOURCES

- Searches conducted through Google and Google Scholar yielded publicly accessible material from governments, supra-government agencies, academic institutions, community agencies, consultancies, and commercial ICT enterprises.
- A key dataset examined was the Factiva global newspaper, magazine and blog aggregator, which contains more than 9,000 academic and trade journals, company information, news and financial information sources. Researchers conducted searches for the period 2003 to 2015.
- Researchers deployed search terminology to examine the International Telecommunications Union website. ITU publications, including the 2014 ITU data yearbook and ICT-Eye, also informed this report.
- A range of ICT industry assessment websources were also consulted including: [www.budde.com.au](http://www.budde.com.au); [www.telegeography.com](http://www.telegeography.com); <http://www.digital-review.org/>
- The websites of national regulatory authorities were subject to general searching as well as more focussed examination – particularly in relation to digital development policy.
- All material included in this report has been sourced from the public domain. The authors acknowledge the contribution that research conducted by government, community and commercial agencies, have made to our understanding of public wi-fi and broader ICT provision in the APEC+ economies.

# Terminology and Abbreviations

- Internet Users – used the internet in last 12 months.
- Telco MARKET competition segments: Local Fixed Line Services, Domestic fixed long distance , International Fixed Long Distance, Mobile, IMT (3G, 4G, etc.), Wireless Local Loop, DSL, Cable modem C\* P: 1991, Fixed Wireless Broadband, Leased Lines, International Gateways, Internet Services, Cable Television, Fixed Satellite Services (FSS), Mobile Satellite Services (MSS), VSAT. RATINGS: M: Monopoly, P: Partial competition (year when competition was introduced), C: Full competition (year when competition was introduced), N: N/A
- USOF – Universal Service Obligation Fund – used to finance expanded service provision, usually across a range of telecommunication segments
- LTE - Long-Term Evolution, commonly marketed as 4G LTE
- Triple play services – broadband, television and telephone.
- Carrier wi-fi – offered by telcos to enhance mobile service.
- MNO – Mobile Network Operator
- HFC - Hybrid fibre-coaxial is a broadband network that combines optical fibre and coaxial cable.

# Country Profiles

## Australia

### The state of telecommunication and ICT provision, use and policy

- Regulator: Australian Communications and Media Authority (ACMA)

#### **Market structure (level of competition)**

- Competition in all telco segments

#### **Mobile market**

- 107% mobile subscription penetration
- The handset market is being driven by smartphone uptake. This is leading to greater mobile broadband and mobile data use, stimulating operators to fast-track investment in LTE technologies.
- All three mobile network operators now operate extensive 4G Long-term Evolution (LTE) networks.
- Mobile broadband access using 3G and 4G/LTE networks has expanded steadily as users continue to add tablets, modems and phones as alternative communication methods.
- Mobile broadband is a key contributor to the economy. A 2014 ACMA report found that mobile broadband had led to an increase in Australia's economic activity of \$33.8 billion between 2006 and 2013 - of this, \$7.3 billion reflects the impact of productivity growth within the mobile communications sector.
- Smartphone penetration reached about 90% by mid-2014, while surveys have shown that about 60% of respondents have a tablet. These figures will increase steadily into 2015 as a greater number of competitively priced units hit the market, and as the reach of LTE networks widen.

#### **Home access (computer and internet)**

- 83 per cent using the internet
- 83.5 per cent of households have a computer at home
- 83 per cent of households have Internet access at home

#### **National policy framework**

- The amended NBN architecture, with less emphasis on FttP, has also meant that the number of customers expected to migrate from copper to fibre-based services is far lower than initial NBN Co forecasts.
- NBN aims to reach 3.6 million premises by June 2016

#### **Telco funding opportunities (USOF)**

- USOF: carriers with eligible revenue over \$AU25m pay an annual industry levy as a percentage of net revenues (turnover).
- In common with other maturing markets, growth in the number of broadband subscribers has slowed in recent years in the wake of higher penetration.
- There has also been a shift in consumers adopting mobile-only broadband solutions, commonly associated with customers choosing to forgo fixed-line telephony services.

## Public wi-fi developments

- The Australian Communications and Media Authority (ACMA) released a report stating that comparatively to other nations, up until 2012, Australian cities were significantly lacking infrastructure and access to public wi-fi despite early roll out of programs by the two major telcos Telstra and Optus in 2003.
- There has been resurgent interest in wi-fi, with Telstra in mid-2014 announcing plans to invest more than \$100 million to build a network of some two million hotspots across the nation within five years. This is complemented by a growing number of municipal-backed wi-fi zones.
- In 2014, Telstra launched a trial of 2,600 limited free (30 minutes) wi-fi hotspots to its customers across the country. The Company stated that during the trial period, they had 1.5 million unique devices connected to the network.
- A report released by Cisco, projects that by 2019, 72 per cent of all data traffic will be wireless and therefore greater investment should be made in places of user relevance: public places such as shopping centres, stadiums, parks.
- Concerns have been raised by ACMA regarding the large uptake of streaming and the impacts on bandwidth capabilities.

# Bangladesh

## The state of telecommunication and ICT provision, use and policy

- Regulator: Bangladesh Telecommunication Regulatory Commission

### **Market structure (level of competition)**

- McKinsey Internet Barriers Index ranks countries on their performance in the face of inadequate infrastructure, affordability, user capability, lack of incentives challenges. Bangladesh in bottom five.
- Local Fixed Line Services M, Domestic fixed long distance P\* P: 2009, International Fixed Long Distance P\* P: 2011, Mobile C\*, IMT (3G, 4G, etc.) P\* P: 2009, Wireless Local Loop P\* P: 2008, Fixed Wireless Broadband C\*, Leased Lines P\* P: 2009, International Gateways P\* P: 2008, Internet Services C\*, VSAT P\* P: 2003

### **Mobile market**

- The rapid expansion of the mobile market from 2007 was underpinned by deregulation, including encouragement of foreign investment. The state maintains one operator: Teletalk.
- Four mobile operators acquired 3G spectrum in September 2013. By March 2014 there were around 2.5 million 3G subscribers. 74 per cent mobile subscription penetration

### **Home access (computer and internet)**

- Underpinned by the expansion of wireless services, Internet use has doubled in the last three years. This was from a very low base and usage is only 6.5 per cent of the population (2014).
- Households with a computer 5.8 per cent, Households with Internet access at home 4.6 per cent
- Bangladesh has a very small fixed-line segment and teledensity has stagnated at less than 1 per cent (the lowest in South Asia).

### **National policy framework**

- Government has launched the Digital Bangladesh (DB) strategy aimed at creating: digitised government, ICT-enabled services, nationwide Internet connectivity, a high-tech park for businesses and ICT-trained human resources by 2021.

### **Telco funding opportunities (USOF)**

- USOF: Have a Social Obligation Fund (SOF), 1 per cent revenue sharing.

## Public wi-fi developments

- National policy interest in wi-fi as part of 'Digital Bangladesh' broadband policy. This policy platform aims for 40 per cent internet penetration by 2015, 70 per cent by 2018 and 100 per cent by 2021. As part of policy the government published wi-fi guidelines for the deployment of private telco operated wi-fi networks throughout the country. The Prime Ministers' Office with support from UNDP and USAID is committed to an Access to Information (a2i) program that also has a public wi-fi component.
- The Bangladesh Telecommunication Regulatory Commission (BTRC) stipulates that telcos cannot currently offer public wi-fi services unless partnering with an ISP. In 2013 first commercial wi-fi hotspot services offered by telcos. As of 2014 offered by Airtel, GrameenPhone, Robi Axiata and Banglalink in collaboration with iConnect and other partners.

- In 2014 State-run Bangladesh Road Transport Corporation (BRTC) introduced 10 public buses offering free wi-fi facility. Access to Information (a2i) programme under the Prime Minister's Office was extending technical support to BRTC for the wi-fi service.
- Free wi-fi service launched at Bangladesh Secretariat in 2014 – although unclear whether general public can access. Likewise universities (including Dhaka University) have rolled out wi-fi.
- The government has plans to establish 100,000 wi-fi hotspots with the assistance of China in different rural areas to provide free Internet connectivity with the aim to diminish the information and communication gap between the urban and rural areas. (Digital divide response).
- National government broadband policy set to encourage PPP (seeks to understand service gaps, and improve collaboration)
- Some regional activity – particularly urban. In 2015 Newly elected Dhaka South City Corporation (DSCC) Mayor Sayeed Khokon announced expansion of wi-fi into public places to ensure free Internet service for people. Free Wi-fi services will be offered in public places like the launch terminal, Nagar Bhaban and railway station. No specific rationale foregrounded.

# Brunei Darussalam

## The state of telecommunication and ICT provision, use and policy

- Regulator: Authority for Info-communications Technology Industry of Brunei Darussalam (AITI)

### **Market structure (level of competition)**

- The telecommunications market is dominated by Telekom Brunei (TelBru), the corporatized successor of state-owned incumbent JTB (although there are plans to privatise the incumbent telco, it remains under the wing of the government).
- No current market structure data

### **Mobile market**

- Strong wireless telecommunication demand based on high GDP per capita. Mobile penetration reached 115 per cent in 2014.
- Around half of Brunei's Internet subscribers are on a mobile broadband platform.

### **Home access (computer and Internet)**

- 65 per cent using the internet
- Households with a computer 90.6 per cent, Households with Internet access at home 75.8 per cent
- More than 90 per cent of Brunei's Internet subscribers have high-speed broadband access, with around half of these on a mobile broadband platform (as mentioned above).

### **National policy framework**

- A small wealthy nation in South East Asia, Brunei made early moves to ensure that it was delivering up to date telecommunications services to its population. Telecommunications infrastructure and services throughout Brunei are of a generally high standard and the country ranks well in Asia in terms of both telecom service penetration and infrastructure facilities.
- The government issued a National Broadband Blueprint, with a primary objective being to increase the ICT industry's contribution to GDP to 6 per cent by 2015.

### **Telco funding opportunities (USOF)**

- No universal service fund

## Public wi-fi developments

- No obvious policy outline for public wi-fi. It does not appear in the national government's ICT development plans (National Broadband Blueprint).
- 2011 talk of expansion of wi-fi into public schools to enhance education outcomes; schools still seeking improved Wi-fi in 2014 for game-based learning. It was expected that this would fall under the Ministry of Education's 6 year ICT 'e-Hijra' program for public schools.
- Free Wi-fi at airport since 2014.
- 2011 plan to introduce Wi-fi at mosques to attract young people.
- Rising mobile consumption has encouraged telcos to initiate some wi-fi hotspot activity as well as investing in LTE data services and network optimisation.

# Cambodia

## The state of telecommunication and ICT provision, use and policy

- Regulator: Telecommunication Regulator of Cambodia

### **Market structure (level of competition)**

- Cambodia has the least developed telecommunications market in Southeast Asia.
- Competition in all telco segments
- Cambodia largely by-passed building fixed-line infrastructure (teledensity is just 3 per cent) and has launched into alternative telecommunication technologies (digital and wireless).

### **Mobile market**

- There are currently six mobile operators (2014), three of which account for 95 per cent of the total subscriber base. There has been some rationalisation in network providers over the past three years. Mobile subscription penetration is 134 per cent.

### **Home access (computer and internet)**

- Given limited fixed-line infrastructure, Internet take-up rates remained low for many years, with the country claiming one of the lowest Internet penetrations in the region. The introduction of wireless broadband services in 2007 underpinned the expansion of Internet use. International estimates show 1.5 million mobile broadband subscribers by early 2014 (although the regulator claims 5 million internet subscribers in 2014 up from 3.86 m in 2013). The ITU report 6 per cent of the population are Internet users.
- Households with a computer 9.2 per cent; Households with Internet access at home 5.5 per cent.

### **National policy framework**

- The independent Telecommunications Regulator of Cambodia (TRC) was established in 2012. By 2014 the TRC was already playing a key role in the local telecom industry and had prepared a National Broadband Policy.

### **Telco funding opportunities (USOF)**

- No USOF exists (A section on USF is included in draft Telecommunications Law – 2013)

## Public wi-fi developments

- There are no publicly funded wi-fi developments to report.
- Phnom Penh and Siem Reap have a number of Internet cafés, limited access outside main cities.
- Free wi-fi is available at hotels, restaurants, Mini Mart, Café and shopping mall.
- 2008-2010 pilot project by APT & MPTC to build up wi-fi connection from PP to 6 health centres and schools in Ang Snol.

# Canada

## The state of telecommunication and ICT provision, use and policy

- Regulator: Canadian Radio-television and Telecommunications Commission (CRTC ) and Industry Canada

### ***Market structure (level of competition)***

- Competition in all telco segments
- Canada's comparatively low mobile penetration offers room for further subscriber growth.

### ***Mobile market***

- 81 per cent mobile subscription penetration
- Though voice services revenue growth remains stagnant, there is considerable promise in the mobile data sector. About 80 per cent of contract subscribers now have smartphones, and with higher data use. Telcos expect to extend their LTE network footprints to cover 99 per cent of the population. Operators have seen a steady migration among subscribers from feature phones to smartphones.

### ***Home access (computer and internet)***

- Broadband and wireless revenues are continuing to underpin Canada's telecom sector, offsetting the decline in the fixed-voice segment.
- 86 per cent using the internet
- 83.6 per cent of households have a computer at home
- 82.6 per cent of households have Internet access at home

### ***National policy framework***

- The government has endeavoured to encourage market competition by ensuring that blocks of spectrum have been reserved for new entrants, while blocking deals which would have concentrated spectrum either regionally or nationally among the three main networks operators.
- Canada has one of the highest broadband penetration rates among the OECD nations. Government policy has encouraged widespread broadband availability, particularly in rural and regional areas, resulting in near comprehensive accessibility to broadband services.
- Recent developments include government relaxing foreign company ownership rules in the telecom sector.

### ***Telco funding opportunities (USOF)***

- Have USOF: Companies contribute annually to a central fund based on their revenues, all operators (TSPs) with revenues greater than \$10 million (CAD), Percentage: 0.63 per cent of an operator's contribution-eligible revenue.

## Public wi-fi developments

- SaskTel closes the Saskatchewan! Connected wireless Internet network in 2013 due to low usage rates across the province. However, it kept some selected hotspots open with plans for future hotspot allocation based on demand.

- In 2015 BAI Canada and the Toronto Transit Commission (TTC) signed a free public wi-fi agreement for selected underground stations in preparation for the 2015 Pan Am and Parapan Am Games. In the deal BAI Canada will pay the TTC \$25 million dollars over the next 20 years for the rights to install and operate the wi-fi system.
- Shaw Communications extends its wi-fi network making it the largest free wi-fi network in Canada with over 60,000 free hotspots.
- Rival company Telus launches 8000 wi-fi spots across B.C and Alberta in response to the Shaw's network expansion.

# Chile

## The state of telecommunication and ICT provision, use and policy

- Regulator: Subsecretaria de Telecomunicaciones (Subtel)

### **Market structure (level of competition)**

- Competition in all telco segments
- Chile's telecom sector is one of the most open and mature in Latin America, with full competition allowed in all areas, excellent infrastructure and a progressive regulatory system encouraging competition.
- Fixed-line services dominated by the incumbent Telefónica Chile, trading as Movistar, its main competitors are VTR Globalcom (wholly owned by Liberty Global), the GTD group, Entel, and Claro.

### **Mobile market**

- 134 per cent mobile subscription penetration
- Fixed-mobile substitution is particularly strong in Chile. The consumer trend to adopt mobile services for both voice calls and broadband is further reducing demand for fixed-line infrastructure.
- Chile's mobile penetration is one of the highest in South America. Movistar and Entel are the market leaders. LTE services are offered by all three MNOs, which has stimulated the sale of smartphones as well as mobile data use among consumers.

### **Home access (computer and internet)**

- 67 per cent using the Internet
- 57 per cent of households have a computer at home
- 49.6 per cent of households have Internet access at home

### **National policy framework**

- Chile deregulated its telecom industry in the early 1980s and the national network was fully digitalised in 1996.
- Competition, investment and innovation have been key factors in the development of the country's telecommunications.
- Chile has one of the highest broadband connection rates in Latin America. This is largely attributable to the government policy to promote the use of broadband and the private sector commitment to its development. The government has a separate programme of installing broadband connections in less developed areas, schools and public places.
- A Digital Agenda for 2013-2020 has set out a roadmap for the development of Chile's ICT sector, including strategies and specific initiatives and goals to facilitate improved telecom access for all citizens. This includes Public wi-fi expansion.

### **Telco funding opportunities (USOF)**

- The USO fund, known as Fondo de Desarrollo de las Telecomunicaciones (Telecom Development Fund) administered by Subsecretaria de Telecomunicaciones (SUBTEL), the regulatory agency, was the main fund provider for connecting the schools with broadband. Government budget percentage: 0.04.

## Public wi-fi developments

- McDonalds (2005) wi-fi market entry – common ‘public wi-fi’ leader.
- In May 2013, Chile’s President Sebastián Piñera announced the Digital Agenda 2013-2020 under which the country aims for ICT to account for 10 per cent of GDP by 2020.
- One of the goals is to increase the current 40.7 per cent Internet penetration rate to 80 per cent in 2020. Chile’s telecoms regulator Subtel will play a role in that aim, through its universal services fund (FDT), adding 1,036 free public wi-fi hotspots nationwide. Other goals include 100 per cent access to digital resources in Chile’s schools by 2020 and 95 per cent of government paperwork carried out online. (Universal Service Funds operate in a number of countries. Essentially incumbent operators are required to allocate a designated portion of their net earnings to the fund to expand service provision (particularly used for rural development).
- In 2013 the national government (in collaboration with regional governments) launched a major PPP investment in free wi-fi hotspots to reduce digital divide. 1,364 wi-fi hotspots in 341 locations across Chile. Subtel will allocate funds up to a maximum of CLP7.845 billion (USD15.4 million) for the project, financed by the Telecommunications Development Fund (FDT) and regional governments. “This initiative aims to our goal of bridging the digital divide and facilitate citizen access to the knowledge society, therefore allow us to advance the enormous challenge of bringing Chileans to build a fairer country” said Minister of Transport and Telecommunications, Andrés Gómez-Lobo”. These hotspots have 30 min sessions with unlimited logins.
- 2014 - final phase of wi-fi ChileGob program. Coverage now extended to all regions of the country. Mandate by President Michelle Bachelet to connect the entire country, following the logic of decentralisation and partnership between the public and private sector.
- Research has shown that the potential of libraries and post offices to provide public Internet access is currently not yet fully tapped. For example, worldwide, only 10 per cent of post offices provide public access to the Internet, even though 20 per cent of post offices have a broadband Internet connection. There is huge potential, if all post offices were provided with broadband Internet and offered this as a service to the public. According to the Universal Postal Union (UPU), increasing the proportion of post offices offering public Internet access to over 45 per cent would ensure that up to a third of all rural areas and small towns had access to the Internet, while with 60 per cent coverage half of all rural areas would be connected. (Measuring the Information Society Report 2014 Executive Summary ITU).

# Hong Kong

## The state of telecommunication and ICT provision, use and policy

- Regulator: Office of the Telecommunications Authority (OFTA)

### **Market structure (level of competition)**

- Hong Kong is one of the most sophisticated and dynamic telecommunications markets in the world.
- Competition in all telco segments

### **Mobile market**

- The country has substantial infrastructure supporting one of the world's highest population penetration of mobile and fixed telephone services at 237 per cent and 47 per cent respectively.
- All operators now operate LTE services. The strong up-take in 4G has seen an encouraging lift in ARPU. Data contributions to mobile revenue exceed 50 per cent.

### **Home access (computer and internet)**

- Hong Kong supports access to broadband connectivity for more than 80% of all households. Internet usage is 74 per cent of population. The number of broadband subscribers represents about 75 per cent of the total Internet subscriber base and 80 per cent of broadband is Fibre-based service.
- 81.9 per cent of households have a computer
- 79.9 per cent of households have Internet access at home

### **National policy framework**

- Hong Kong's regulator, the Office of the Communications Authority (OFCA), has played a major role in developing the telecom sector.

### **Telco funding opportunities (USOF)**

- Have USOF: Starting from May 2009, commercial contribution is based on the quantity of telephone numbers allocated by the Regulatory Authority to the contributing parties.

## Public wi-fi developments

- In 2014, the Hong Kong government consulted with IBM to plan the future of the city's ICT roadmap. It resulted in the 'Smarter City, Smarter Living' strategy and forms part of the larger, continuously evolving Digital 21 Strategy.
- As part of the 2014 Digital 21 Strategy, the Hong Kong government launched a free wi-fi service called Wi-fi.HK. This is a free or mostly free (time limit dependent) service supplied by both the private and public sector.
- In most public spaces such as parks there is a government run wi-fi service 'GovWiFi'.
- There are also specific tourist location based wi-fi services such as HKBN and Y5ZONE providing free wi-fi.
- The transportation system, MTR, also boasts its own free wi-fi service for commuters at stations.

- Another free wi-fi service known as csl hotspots are available at MTR stations, and cafes, fast food places and convenience stores. This service appears to be specifically aimed at tourists, offering free access to the tourism board website, for example.

# India

## The state of telecommunication and ICT provision, use and policy

- Regulator: Telecom Regulatory Authority of India (TRAI)

### **Market structure (level of competition)**

- Competition in all telco segments except partial competition for IMG (3G, 4G), and monopoly Fixed Satellite services.
- Sweeping reforms introduced by successive governments from the mid-2000s has dramatically changed the telecommunications environment of India. The government committed to opening up the market to more competition and investment and in 2013 removed the 74 per cent FDI cap for the sector. The sector is home to a group of global operators working with local companies.

### **Mobile market**

- From a humble start, growth in India's mobile sector rapidly picked up pace and developed a sustained momentum. After a brief stall in 2012/13 the market recovered in 2014 and there is now 71 per cent mobile subscription penetration (clearly there is room for more growth). The key drivers are also still in place: cheap call rates, low handset prices and rising incomes among a middle class numbering in the hundreds of millions.
- In recent years there has been a major push to take mobile services into poorer and rural areas of the country. Especially with the launch of the government's 'Digital India' campaign.
- 3G spectrum was not released until 2010. The roll-out of 4G/LTE networks began in 2012 and competition is increasing with Reliance Jio launching 4G in December 2014 and going head-to-head with Bharti Airtel.
- Mobile money services have become important including Vodafone mobile wallet service M-Pesa and Airtel Money.
- Mobile broadband is expected to lift broadband penetration significantly. 15 per cent using the internet.

### **Home access (computer and internet)**

- 11.9 per cent of households have a computer at home
- 13 per cent of households have internet access at home
- The government has made an effort to promote broadband internet, by early 2014 there were only around 15 million fixed broadband subscribers – a penetration of slightly more than 1 per cent. According to the sector regulator this has shown an increase to 100 million broadband subscribers at the end of April 2015.

### **National policy framework**

- Although it has less than 3 per cent fixed-line penetration, India has achieved a remarkable national coverage, with 99 per cent of the population having some form of access to a telephone. It has been the heavy investment in telecoms infrastructure over the last decade, plus a number of key regulatory initiatives that have combined to see India's huge population delivered at least some level of telephone service.

### ***Telco funding opportunities (USOF)***

- Have USOF: 5 per cent of Adjusted Gross Revenue (AGR), Administrator, Universal Service Obligation Fund, Ministry of Communications & IT

### **Public wi-fi developments**

- There seems to have been limited public wi-fi activity in India during the 2000s and into the 2010s. Since 2014 there has been a flurry of activity with a range of stakeholders and business models. It is unclear how much duplication there is with Federal, State and Local government and private providers including state run telco BSNL.
- The government includes wi-fi as part of Digital India policy platform aiming to transform the country into a digitally empowered knowledge economy. The policy sets a target of 600 million broadband connections by 2020. The policy is heavily based on the growth of mobile broadband. Despite a growing number of smartphone users, 'seamless network experience' is still missing. 3G was expected to turn around things in the telecom segment, but slow expansion and lack of affordable data packs marred the plans. Now, sights are set on LTE – the next generation broadband technology. India's 'digital' campaign is certainly going to depend on the LTE growth. However, factors such as low-cost device ecosystem, data growth and additional spectrum in relevant bands are equally important factors that'll help achieve the Digital India vision. Heterogeneous networks will need to be established with a mix of macro sites, micro sites, small cells and wi-fi hotspots to manage coverage, capacity and network performance for maximum user experience.
- In June 2015 state run telco Bharat Sanchar Nigam Ltd. (BSNL) revealed plans to set up 40,000 public wi-fi hotspots in India by 2018 at a cost of USD1.2 billion. It has already rolled out 200 spots and expects to complete 2500 in 2015. It is currently calling for tenders. The service will provide limited free wi-fi services (30 minutes per 24 hours x three times per a month which visitors can utilise in multiple sessions. The service can be used on paid basis after the free sessions expire at nominal subscription plans starting from 30c US per 30 mins (USD1.1 per day). BSNL CMD Anupam Srivastava stated that the free wi-fi hotspots will help the state run telecom operator take on private telecom operators. "Our 3G reach is around 60% across 20 circles. By offering 40,000 wi-fi hotspots, we will be able to reach out to almost 85% of our total network with high-speed internet services," said Srivastava. Wi-fi spots will also lower traffic burden on telecom networks.
- Bangalore/Bengaluru claimed to be first Indian city to have free wi-fi hotspots in Jan 2014. The Namma Wi-fi 6 location pilot phase allowed users 3 hours and 50mb per day with login requiring a mobile phone number to obtain a login passkey. The service funded by the Karnataka state government was built and operated by private ISP D-VoiS. D-VoiS also introduced two apps integrated into the wi-fi service that helped users identify city parking and waste disposal options. The service was extended to some limited locations in other cities including Bagalkot and the city bus stand in Mysore/Mysuru. Usage numbers for Bangalore sites were approximately 800 people per location per day by May 2014. At this time the government indicated it would extend the service more broadly to other cities. Officials in the Department of Information Technology revealed that an Expression of Interest (EOI) for the extended project would be developed by the end of May and the project launched within four months. In December 2014, the government revealed that within a month the wi-fi service would be extended to more than 100 junctions in Bangalore, including the city's tech corridors. The rationale for the extension was the desire to make it easier for people to access various services of the state government using wi-fi facilities. The government had recently launched its mobile governance programme and the wi-fi network would help facilitate its uptake. Despite the expanding investment in public wi-fi there complaints about useability of the network emerged as early as July 2014. The government explained at this time that it had no service agreement with D-VoiS as it provided the service free to the government and therefore was limited in how it could respond to QOS issues. In June 2015, the planned extension of the service across Bangalore had not be realised and questions emerged about the financial feasibility of the rollout.

The project was estimated to cost Rs 500 crore (USD100 million). The government is deliberating over whether it should make such a huge investment or should outsource it to private companies. The model would be PPP with the Minister indicating: "There is tremendous scope for investors to make profits through advertisements. But to make those profits, the government has to first invest a lot of money and only then we can think of the revenue. If the government decides to outsource the project to private companies, then we need to decide on the profit-sharing ratio. Hence we have forwarded the matter to the finance department, both to decide whether to make the investment and if not, what the profit-sharing ratio should be".

- In February 2014 the world's largest stretch of free wi-fi zone (20 KM) was launched in the city of Patna and IT minister Shahid Ali Khan said wi-fi would be provided at all tourist spots across the state of Bihar. There has been criticism of speed/useability of the network subsequently provided. The wi-fi zone is part of a broader policy suite seeking to establish Bihar as the IT State (Multiple IT parks are planned around the state in popular areas to capture the booming IT industry).
- In December 2014 the Indian Department of Telecom with the Ministry of Urban Development announced a plan to make wi-fi hot spots in cities with population of over 1 million and in tourist centres under its Digital India program. DoT held meetings with telecom operators for the scheme. The government has plans to empanel 3-4 wi-fi service providers for speedy roll out of wi-fi hotspots (expected by June 2015), but is yet to decide if the service will be free or chargeable (not sure on current status). The national government will facilitate permissions required from local authorities for network roll out. It is unclear whether they have reached this target time-frame.
- In June 2015, the Municipal Corporation of Gurgaon (MCG) outside New Delhi revealed it would roll out Wi-fi services at five locations in the city by mid-September. A 5 year contract has been awarded to Airtel to supply, configure and install Wi-fi services, provide a web-based portal for the user logins paying MCG Rs.10 lakh (USD15,000) to the MCG for using its infrastructure to provide the wi-fi services. The services will be an open platform for mobile phones users with wi-fi compatible devices in these localities with a daily quota limit of 30 minutes per day per device. Post 30 minutes while users can continue to use the wi-fi services, they will be charged a nominal amount and can also consume data from their data packs.
- In April 2015, the small village of Tilla Shahbazpur, eight kilometres from Delhi, rolled out a village wide wi-fi zone without government assistance. The community pooled together funds to contract a network developer to install a backhaul microwave tower and series of APs throughout the village. The wi-fi zone covers approximately 2.5 kms and currently services 2,700 mobile users. The community has stated that the implementation of the wi-fi zone has improved economic conditions as people have better access to commodity pricing indexes to engage in trade.
- In February 2015 Kolkata's city's first public wi-fi hotspot was established, paving the way for a gradual rollout in the rest of Kolkata by early 2016. The service, provided by Reliance JIO, will initially be free of charge.
- In 2015 contractual issues with relation to public wi-fi PPPs in New Delhi, stalled rollouts. This included conflict between tendering hardware and network suppliers and uncertainty around project specifications.
- In 2014 Ozone claimed to have over 1200 wi-fi hotspots in the country and provides free wi-fi to users around those hotspots. The network has partnerships with brands like Subway, Haldiram's, McDonald's, Mumbai International Airport, Baskin Robbins, Gloria Jean's Coffees etc., to provide wi-fi connectivity in those locations, as well as to distribute advertising over its networks.
- Aircel started rolling out wi-fi hotspots in February 2011 and had claimed to have 50,000 wi-fi Zones across India, however the telco has stopped promoting the service during 2014 and it is not clear on where the initiative stands at the time of writing this article.

- In 2014 Vodafone provided a wi-fi zone for its customers at the Belvedere Rapid Metro Station in Gurgaon, as a part of its branding exercise at the Rapid Metro Station in Gurgaon while the government owned MTNL had stated plans to launch wi-fi hotspots with speeds of 8Mbps for its customers in Mumbai and Delhi.
- In 2014 Tata DOCOMO had an exclusive agreement with GMR Airports to offer wi-fi services at the Indira Gandhi International Airport in New Delhi, Tikona had planned to launch a wi-fi network at the Maharana Pratap Inter-State bus terminus (ISBT) in partnership with the Delhi Transport Corporation while Videocon Telecom had partnered with Chinese telecom equipment vendor Huawei to launch wi-fi hotspots in Punjab circle.
- By 2014 Idea Cellular had also launched a wi-fi service in 5 select cities – Ahmedabad, Cochin, Pune, Hyderabad, and Vizag.
- Indian Railways's have had a string of wi-fi pilot projects on Howrah Rajdhani Express, Mumbai-Ahmedabad Shatabdi Express, Chennai- Bangalore-Chennai Shatabdi Express and at New Delhi railway station. The proposal to provide wi-fi on Rajdhani was made in February 2011. The official announcement for the launch of the service was made in March 2012 stating that this service will go live by September 2012. Earlier, pilots to provide Wi-fi have also been implemented on the Mumbai-Ahmedabad Shatabdi Express and Chennai- Bangalore-Chennai Shatabdi Express, both in 2009. The Railway Budget 2013 again announced the launch of wi-fi service on trains during this course of this year. The other announcements made in the Railway Budget 2013 with respect to digital include real time train tracking for passengers, SMS service for passengers to check reservation status, SMS/Voice/email service for passengers to intimate on board train staff about cleanliness of their train, among others. Most of these services have been proposed in earlier budgets as well. The Indian Railways launched their train tracking app, Rail Radar in October 2012.

# Indonesia

## The state of telecommunication and ICT provision, use and policy

- Regulator: Badan Regulasi Telekomunikasi Indonesia / Indonesian Telecommunications Regulatory Authority (BRTI)

### **Market structure (level of competition)**

- No current MARKET STRUCTURE data
- Particularly big challenge to successfully build telecommunications infrastructure required to support a large population spread over a complex geography.
- Two of the more significant challenges have been the crowded operator market, especially the mobile segment (recently experiencing some consolidation), and duration of regulatory decision-making.

### **Mobile market**

- Strong mobile market with new consumer interest in the 3G services and 4G/LTE services. Mobile data service subscriptions and smartphone take up rising rapidly.
- 125 per cent mobile subscription penetration
- Market leader Telkomsel was continuing to dominate the mobile market, with its mobile subscriber base of around 45 per cent market share; Telkomsel and XL Axiata both launched 4G/LTE services commercially in December 2014.
- Data traffic is growing quickly and forecast to expand six-fold, between 2014 and 2020.

### **Home access (computer and internet)**

- 16 per cent population using the internet
- 15.6 per cent of households have a computer at home
- 5.7 per cent of households have internet access at home
- Fixed-line market segment grew through fixed wireless (75 per cent of subs by 2012) but then stalled with mobile broadband growing.

### **National policy framework**

- The government's initiative on national infrastructure will push for fibre and 4G coverage nationwide.

### **Telco funding opportunities (USOF)**

- Have USOF: Percentage of total gross revenues (turnover) Percentage: 0.75

## Public wi-fi developments

- In 2012 Indonesia's second largest telco PT Indosat introduced 'Super wi-fi' hotspots to cope with surge in data traffic. 700 locations in Java and Bali. The service was initially available for free for all Indosat customers as a promotion (access speed of up to 2 Mbps and unlimited data cap). In 2012 PT Telekomunikasi Indonesia (Telkom) announced launch of wi-fi up 100,000 hotspots in 30 cities across all major islands, and aims to have installed one million access points by 2013. (Seem to be delivered through chain businesses – 7Eleven, Dominos Pizza etc).

- As early as 2012 free hotspots deployed as part of political campaign strategies in Jakarta. Free wi-fi was already available in some parks at this time.
- A 2013 report on free park wi-fi noted it was fast – including streaming video.
- Parks program to be extended to all parks in 2015. Government sought to use corporate social responsibility programs of ISPs in facilitating the rollout.
- Early 2000s community wi-fi models developed by a broad coalition of telecentres, or Wartels, cybercafes, and internet activists loosely assembled in a movement known as RebelNe (e.g. RT/RW-Net initiative by Onno Purbo). After 2005 decision to liberate the 2.4GHz wi-fi band “neighborhood networks” popped up all over Indonesia. Now, using wi-fi boosting solutions such as the Wokbolik, these networks can extend up to several kilometres. Developed by Pak Gunadi in Indonesia, the Wokbolik is signal-boosting device made out of a regular USB wireless adapter, a three-inch PVC pipe, and a cooking wok. When connected to a computer and pointed directly at a wireless router from afar, the network reach is drastically increased. With only \$35 worth of equipment, and through sharing the ISP costs, Indonesians formerly unable to afford a connection to the internet can now have access. The broad uptake of this model represents a global phenomenon unique to Indonesia in that it is a bottom-up infrastructure created by a self-supporting, growing cooperative of hackers.
- One grass-roots ‘last mile’ initiative is the RT/RW-Net initiative, a neighbourhood wi-fi project started by retired academic and long-time ICT proponent Onno Purbo. This uses wireless connections to link up to eight houses at minimal cost of around USD 50 to set up and USD 35-40 per month to run. It is unclear how many users have established this low-end system, but in response to the enduring digital divide, it is understood to be growing.

# Japan

## The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry of Internal Affairs and Communications

### **Market structure (level of competition)**

- Competition in all telco segments
- NTT DoCoMo still has a dominant market share, benefitting from its ex-monopoly status and a conservative customer base

### **Mobile market**

- 118 per cent mobile subscription penetration
- With 3G subscriber numbers having peaked at around 97 per cent of all mobile subscribers coming into 2013, Japan has shifted its focus to 4G/LTE becoming the fourth country in the world to introduce this next generation platform. By 2016 there will be approximately 160 million mobile subscribers with the majority accessing services through LTE networks.

### **Home access (computer and internet)**

- 86 per cent using the internet
- 76.2 per cent of households have a computer at home
- 86.2 per cent of households have internet access at home

### **National policy framework**

- Clearly Japan has been a dynamic leader in many aspects of global and regional telecommunications. Japan's sophisticated IT infrastructure and high broadband penetration sets the scene for improved productivity, convergence of industries and a more flexible industrial structure.
- The government has been particularly active in regulating telecommunications in such a way as to introduce more effective competition. This competitive market has been challenged to develop the most effective business structures to achieve commercial success.

### **Telco funding opportunities (USOF)**

- Have USOF: Telecommunications Carriers designated through provision of the telecommunications business law (Interconnecting Telecommunications Carriers, etc.). Telecommunications Carriers Association (Universal Telecommunications Service Support Institution)

## Public wi-fi developments

- Congestion has led to offload investments in wi-fi and WiMAX. Pre-2014, wi-fi hotspots in public spaces were only offered by mobile network operators. This restricted tourist access.
- In 2014, Tokyo and Chiba prefectures began to deploy wi-fi hotspots to offer free internet for tourists as part of preparations for the 2020 Tokyo Olympics. The government stand on these proposed 30,000 hotspots is that its ease of access will be a driving factor in the increase of tourists to the country.
- The wi-fi spots also form part of Japan's strategic natural emergency disaster preparedness and response for tourists in the event of a natural disaster. It comes at a cost of roughly ¥31.1 billion and is funded through private and public investments.

- Japan boasts over 900,000 current wi-fi hotspots. However, as stated above, the majority of these hotspots are restricted to mobile carrier customers. In a new 2015 initiative, the government of Japan has negotiated a deal with the private telcos whereby in the event of a natural disaster, emergency wi-fi will be available across the entire network for the public within 72 hours.

# Malaysia

## The state of telecommunication and ICT provision, use and policy

- Regulator: Malaysian Communications and Multimedia Commission (MCMC)

### **Market structure (level of competition)**

- MARKET STRUCTURE: Competition in all telco segments

### **Mobile market**

- Telco market has been expanding with a significant number of new licences being granted. Fixed-line subscriber base is shrinking but mobile market has grown rapidly - penetration approaching 150 per cent.
- Multiple 4G/LTE licences issued in late 2012 and the launch of a series of advanced mobile broadband networks in 2013.
- The number of operators in Malaysia reduced from five to three and then, with 3G licences having been awarded in a two stage process, next generation services have since been rolled out and had started having a major impact on the market.
- Progress reported on closing the urban/rural divide, with expanding mobile infrastructure in rural areas

### **Home access (computer and internet)**

- The country's broadband strategy was given a major boost when the government chose Telekom Malaysia to roll out a National Broadband Network (NBN). In 2014 government committed a further US\$1 billion for the second phase of the project.
- High speed broadband reached 67 per cent household penetration in 2014. Of the six million broadband subscriptions around 60 per cent are wireless.
- 65.1 per cent of households have a computer at home
- 64.7 per cent of households have internet access at home

### **National policy framework**

- Over the last two decades Malaysia has been working towards a clear national objective to see it ranked as a fully developed nation by 2020. The task of building an advanced telecom sector has been regarded as central to achieving Vision 2020.
- Substantial government participation in Information & Communications Technology (ICT) development has also been a particular characteristic of the Malaysian market.

### **Telco funding opportunities (USOF)**

- USOF: 6 per cent of weighted net telecom revenue

## Public wi-fi developments

- The 'Penang Free wi-fi' initiative was launched in 2009 and currently counts 1550 hotspots available at public places such as parks and recreation centres.
- The company providing the 'Penang Free wi-fi', Hotgate Technologies, claims that "on the whole, [Penang Free wi-fi] supports the government's efforts to build stronger internet penetration in the

country. It is also an effective way to assist the Penang state government to bridge the digital divide between the rural and urban areas.” (Michael Yang quoted in Bloomberg, 2008: <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=agByvFBEEkS>)

- Wireless Village initiative 1Malaysia (KTW) is a program under Commission in providing Wi-fi hotspots at selected locations mainly in rural areas.
- Ruckus Wireless Technologies have been in talks with the Malaysian government to expand the free wi-fi market in the country. The company has been focusing its efforts in promoting free public wi-fi as an effective tourism initiative.
- In 2014, the Malaysian Communications and Multimedia Commission (MCMC) raised concerns regarding the broadband speeds available across hotspots in the country. It has been at the forefront of a push to implement the High Speed Broadband Project under the National Broadband Initiative (NBI). This has resulted in issuing new spectrum to carriers and urging by the MCMC to businesses to upgrade their internet connections to increase wi-fi penetration and speed.
- In 2015, Pos Malaysia and the Malaysian Communications and Multimedia Commission announced it will roll out a free wi-fi service to 700 post offices nationwide in stages, with the main priority being post offices at rural areas.

# Mexico

## The state of telecommunication and ICT provision, use and policy

- Regulator: Instituto Federal de Telecomunicaciones (IFT) Federal Telecommunications Institute

### **Market structure (level of competition)**

- Competition in all telco segments
- The market is dominated by the incumbent Telmex, with about 80 per cent market share, while the mobile market is dominated by Telmex's sister company Telcel, both owned by América Móvil.
- A telecom reform law passed in mid-2013 set up a new regulator, removed barriers to foreign investment and has introduced measures to reduce América Móvil's market share.
- With a population of around 109 million and a fixed-line teledensity of around 17 per cent, Mexico's telecom sector retains significant potential for growth.

### **Mobile market**

- 86 per cent mobile subscription penetration
- Growth in the mobile market has begun to slow in response to higher penetration. Telcel dominates the market, accounting for about 70 per cent of subscribers.
- Mobile data is rapidly emerging as a key driver, with LTE infrastructure expanding across the country.

### **Home access (computer and internet)**

- The broadband sector is one of the highest growth areas in Mexico's telecoms market. The country's broadband penetration is amongst the second lowest among the 34 OECD countries, and consumer prices remain high. 43 per cent using the internet.
- 35.8 per cent of households have a computer at home
- 30.7 per cent of households have internet access at home

### **National policy framework**

- The government's CompuApoyo initiative targets 1.7 million homes for computers and broadband access

### **Telco funding opportunities (USOF)**

- USOF seems to be voluntary contribution based (data from 2008).

## Public wi-fi developments

- Access to Broadband internet through the Connected Mexico Program. Access to broadband internet in public places will be guaranteed by identifying the number of buildings to be connected each year, until universal coverage is achieved. Efforts will be made to ensure that in public places, broadband connectivity has sufficient capacity to meet demand and therefore the potential number of users at each site must be considered. Mexico will have a total of 100,000 sites nationwide providing free broadband access by the end of 2015, according to the country's President Enrique Peña Nieto. These sites will benefit a total of 28 million users across Mexico. The country currently has over 65,000 public sites. The national connectivity program Mexico Conectado (Connected Mexico) stipulates a total of 250,000 sites nationwide providing free broadband access by 2018. The project

stipulates the deployment of free connectivity in public areas including schools, parks, libraries government buildings and hospitals. 50% of sites have wi-fi.

- In order to increase the free wi-fi network, the government is auctioning off the available 700MHz in a shared telecoms network initiative.
- Mexico has wi-fi hotspots not only in major centres but also in the more rural areas, this push for wi-fi penetration is part of a government policy stance that would see internet connectivity as a right for any individual to access, like any other public service. Rural and remote connectivity is part of the 'Mexico Conectado' project to 'reduce the digital divide'. Most of the public investment under this project has been directed towards schools in remote areas, but there is strong support within government and communities to follow Colombia's lead and utilise satellite technology for these remote communities.

# New Zealand

## The state of telecommunication and ICT provision, use and policy

- Regulator: Commerce Commission of New Zealand (ComCom)

### **Market structure (level of competition)**

- Competition in all telco segments, except monopoly in cable provision, partial competition in domestic long distance, fixed wireless broadband, fixed satellite (data from 2010).

### **Mobile market**

- 106 per cent mobile subscription penetration
- The uptake of mobile broadband has been bolstered by the expansion of mobile technologies based on LTE, offered by all three network operators. With spectrum auctions allowing for the expansion of LTE networks, and further regional deployment of 3G coverage under the RBI, we expect to see steady subscriber growth across the networks.
- By late 2014 Vodafone NZ reported that more than 500,000 subscribers were on its LTE-enabled plans, and that LTE-capable devices accounted for a third of all device sales during the previous 12 months.

### **Home access (computer and internet)**

- 83 per cent using the internet
- 77.3 per cent of households have a computer at home
- 76.8 per cent of households have internet access at home
- New Zealand has experience steady growth in fixed broadband penetration in recent years. The overall number of broadband subscribers grew by just under 10 per cent in 2013, maintaining the momentum seen since 2010.

### **National policy framework**

- New Zealand's Ultra-Fast Broadband/Rural Broadband Initiative (UFB/RBI) is continuing to make steady progress with 536,000 premises (just under the projected 1.2 million of the completed projected) having been rolled out. Currently 55,000 premises have signed up for services (10 per cent uptake).

### **Telco funding opportunities (USOF)**

- Have USOF: Industry levy paid direct to service provider, percentage of gross retail revenue

## Public wi-fi developments

- In 2014, South Canterbury launched an initiative to make the region the 'most connected' in the country, with a joint deal between the Aoraki Development Business and Tourism (ADBT) and private firm, Vetta Technologies to bring free wi-fi throughout the region's town centres.
- This initiative formed part of a larger scheme called 'Gigatown' which was a nationwide competition aimed at raising awareness of internet connectivity and promoting development and investment in wi-fi access. The competition attracted 50 towns to enter (each required to develop a plan outlining how they would use the gigabit services in their town to promote connectivity. The Gigatown competition promoted earlier work undertaken in the US, namely another 'Gigatown' exemplar, Chattanooga, TN.

- 'WifiGen', a Pakistani start up company funded heavily by a former IBM vice president, landed its first contract in New Zealand. The business model of this company is predicated on a business embedding the WifiGen's solutions to their existing wi-fi hotspot for data mining purposes. It works by offering free wifi to customers if they log on with their social media accounts such as Facebook, Google+ and Twitter, and offering bonus deals such as discounts if the customer chooses to share their location.
- Other wi-fi companies such as Purple WiFi are also investing in both New Zealand and Australia with data mining through social media logins. Purple WiFi claims they are working with major telecom providers in both New Zealand and Australia.

# Papua New Guinea

## The state of telecommunication and ICT provision, use and policy

- Regulator: National Information And Communication Technology Authority (NICTA)

### **Market structure (level of competition)**

- No current MARKET STRUCTURE data
- The industry is moving from vertical to horizontal integration. PNG's state-owned incumbent Telikom is being restructured to focus on retail services and its network will be transferred to a new state-owned company, DataCo. Any service provider in PNG will be able to lease bandwidth at non-discriminatory wholesale prices from DataCo.

### **Mobile market**

- Mobile broadband is proving far more successful than fixed-line broadband, having reached an estimated 9 per cent penetration. The number of mobile broadband users is expected to grow strongly as Digicel continues to expand its 3G and 4G networks.
- 41 per cent mobile subscription penetration
- Progress in telecommunications has come primarily from mobile networks, triggered by the start of competition in 2007, with accessibility expanding from less than 3 per cent population coverage in 2006 to almost 80 per cent in 2015. When it entered the market, Digicel brought mobile services to unserved areas and slashed prices. The result was a substantial increase in mobile penetration – from 1.6 per cent in 2006 to 35 per cent in 2015. This is still extremely low and barriers to uptake remain. PNG is still one of the least affordable mobile markets in the Pacific.
- Despite the increase in mobile coverage, most rural areas still have only 2G services.

### **Home access (computer and internet)**

- Network deployment costs are high in PNG due to the relatively low subscriber base, the impervious terrain, and the high proportion of the population living in rural areas. As a result, fixed telecom infrastructure is almost inexistent outside urban centres, leaving most of the population unserved.
- 7 per cent using the Internet
- 3.4 per cent of households have a computer at home
- 2.9 per cent of households have Internet access at home
- Even since the introduction of competition Internet access has remained expensive and far beyond the means of the majority of the population. Throughout much of the country, Internet access is not available.

### **National policy framework**

- To address communication infrastructure shortcomings, the government is deploying a National Transmission Network, which is expected to boost bandwidth and encourage market competition. It will be managed by state-owned PNG DataCo, which will act as wholesaler.

### **Telco funding opportunities (USOF)**

- No USOF info

## Public wi-fi developments

- Public wi-fi is only available in select locations in the capital, Port Moresby. It is prohibitively expensive for most public users.
- The lack of connectivity has been raised as a barrier to citizens being able to exercise their right to be part of the digital economy.
- In 2007, only one provider (Daltron) providing public wi-fi (note: not free wi-fi). The hotspots were located in affluent parts of the capital (including the local yacht club and the Crowne Plaza Hotel).
- In 2009, private communications technology company Online South Pacific launched 'WiMax', an initiative to provide wireless technology for businesses to provide wi-fi to customers. It was launched in both PNG and Fiji (known as Unwired Fiji).
- OSP provides wi-fi hotspots at both the domestic and international airport terminals in PNG, as well as at a number of hotels.

# People's Republic of China

## The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry of Industry and Information Technology of the People Republic of China (MIIT).

### **Market structure (level of competition)**

- MARKET STRUCTURE: Limited Competition: Local Fixed Line Services P\* P: 1994, Domestic fixed long distance P\* P: 1994, International Fixed Long Distance P\* P: 1994, Mobile P\* P: 1994, IMT (3G, 4G, etc.) P\* P: 2009, Wireless Local Loop P\* P: 1994, DSL P\* P: 1994, Cable modem 2009 N, Fixed Wireless Broadband P\* P: 1994, Leased Lines P\* P: 1994, International Gateways P\* P: 1994, Internet Services C\*, Cable Television 2009 N, Fixed Satellite Services (FSS) P\* P: 1994, Mobile Satellite Services (MSS) P\* P: 1994, VSAT C\*

### **Mobile market**

- 89 per cent mobile subscription penetration
- 46 per cent using the internet
- Total mobile subscribers were close to 1.3 billion by the start of 2015, with almost 40 per cent of these being 3G. There had been a surprising surge in 4G/LTE services as China Mobile rapidly expanded its TD-LTE network. It claimed more than 50 million subscribers by late 2014.
- The number of internet users had passed the 650 million mark by mid-2014, increasingly accessing websites via mobile phones.

### **Home access (computer and internet)**

- 43.8 per cent of households have a computer at home
- 43.9 per cent of households have Internet access at home

### **National policy framework**

- The telecom market experienced a settling in period after the government initiated a major industry restructure in 2008 for fixed line mobile operators.
- China continues to build a substantial world-class telecommunications infrastructure and the investments show no sign of abating.
- China's National Broadband Plan aims to increase the number of fixed-line broadband households and public wi-fi hotspots, and provide 4M broadband for almost 500 million mobile Internet users.

### **Telco funding opportunities (USOF)**

- No substantive USOF

## Public wi-fi developments

- Lijiang Gaokuai Passenger Coach Station in China has installed a free wi-fi system on nearly 50 buses to provide Internet access for passengers.
- Chinese digital television advertising company VisionChina Media, has partnered with Qianhai Mobile to extend its free wi-fi (Vifi) on buses services. It currently offers free wi-fi on 15,000 buses throughout the country with a hit of 3 million users per day. This new deal has secured 35,000 buses including in major locales such as Shanghai and Schenzhen.

- China's National Broadband Plan aims to increase the number of fixed-line broadband households and public wi-fi hotspots.
- To ease pressure on the bandwidth, China Mobile, is deploying wi-fi within its network. The company claims to have the largest carrier wi-fi in the world with 6 million access points.
- In 2014, China and ASEAN proposed to develop a shared network to promote trade, information sharing, and a system capable of providing 'disaster assessment and precautions'. The proposal included provision of public wi-fi. It was proposed that the 'forthcoming Asian Infrastructure Investment Bank' would 'help with its construction'.
- As part of a 'Smart Cities' push in China, Ruckus Wireless secured a partnership with a large local telco, Shenzhen Topway Video Communication to roll out a 'Smart Wi-fi Municipal Area Network (MAN)'. It will include indoor and outdoor spaces, hospitals, transportation, shopping centres and restaurants.
- Wireless company Baidu, signed one of the country's largest wi-fi networking deals with 16WiFi and VisionChina Connected (the two largest wi-fi providers in the country). The investment is said to have cost in the vicinity of USD\$27 million for Baidu.
- Skeleton Key apps that allow users to access free wi-fi without the need for passwords (through crowdsourcing passwords), have become increasingly popular in China, with one app company (Skeleton Key Wifi) claiming that they have 270 million active users in the country. This app in particular has access to all 8 million hotspots run by the country's largest telecom provider China Mobile.
- In 2014, China Mobile stated that it would stop expanding its wi-fi network due to its 'uneconomic' nature. Despite the company commanding 74% of all wi-fi data traffic in the country, but made up only 2.4 per cent of all revenue.

# Peru

## The state of telecommunication and ICT provision, use and policy

- Regulator: Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)

### **Market structure (level of competition)**

- Competition in all telco segments
- As of 2014 the telecommunications market has a number of commercial players including Telefónica (Movistar), América Móvil (Claro), Mericatel Perú (Eutel), Viettel – with Virgin Mobile planning to enter the market as a Mobile Virtual Network Operator (MVNO)

### **Mobile market**

- 98 per cent mobile subscription penetration
- 39 per cent using the internet
- Peru's mobile penetration is below the regional average, and also hides the fact that about one quarter of the population has no mobile phone at all, while many Peruvians – especially urban dwellers – have multiple mobile subscriptions.
- Only a small fraction of the population use advanced devices

### **Home access (computer and internet)**

- Peru's fixed-line teledensity is the third lowest in South America after Bolivia and Paraguay. Fixed-line infrastructure remains poor in many rural areas with mobile services the preferred alternative.
- 32 per cent of households have a computer at home
- 22.1 per cent of households have internet access at home
- Broadband penetration is considerably lower than the regional average. The country remains affected by wide-scale poverty, limited levels of literacy, low computer penetration, and poor competition, which has made broadband services among the slowest and most expensive in the region. A 2012 report stated that Internet at home penetration in rural areas 'barely reached' 0.5 per cent of homes (Galperin H et al., 2012, p.7)
- Strong broadband growth is predicted in the next five years as a result of the government's national broadband plan which aims to provide internet connectivity via a fibre-optic backbone to many less urbanised regions. Mobile broadband will be the main growth platform.

### **National policy framework**

- Peru has made significant progress in privatisation and liberalisation over the past several years. In 1994 a legislative change opened the telecom market to competition, but protected the incumbent operator for a period of five years.
- The government has shown express interest in opening up competition and as part of the national broadband plan, it is exploring the possibility of a private partnership and further regulatory measures (Galperin H et al., 2012, p. 16)

### **Telco funding opportunities (USOF)**

- USOF: The Fondo de Inversión de Telecomunicaciones (FITEL) or Telecommunications Investment Fund (1991), is regulated by the Ministry of Communications (formerly by OSIPTEL, the regulatory agency), and is part of the same instrument. It provides subsidies for telecom services in rural areas

and other places that are considered uneconomical (Main funding source (FITEL) consists of 1 per cent of all telecom and CATV operator gross revenues)

- As part of Movistar's licence renewal in January 2013, it must invest \$1.15 billion to expand coverage to unserved areas and provide free broadband connections to state schools, healthcare centres, and police stations.

### Public wi-fi developments

- In 2013 Chilean based wi-fi company GestSol was finalising deals with the Peruvian government to provide public wi-fi (not free) in the country. GestSol's work includes wi-fi investments in low income urban areas where large telco presence is minimal and also on public transportation. The company is also working on a similar business initiative in Colombia.
- Ruckus Wireless also boasts a strategic presence in Peru with the 'WIGO Libre!' wi-fi service that provides free wi-fi in public places, both indoor and outdoor in the nation's capital, Lima. The wi-fi service has wi-fi spots throughout the city, including in the national stadium and high profile tourist destinations and shopping centres. It works by offering wi-fi access through social media accounts (such as Facebook) for a 30 minute period and offers bonus discounts, deals and advertising for local businesses.

*Ref: Galperin H, Mariscal J and Viacens F M 2012. 'An Analysis of National Broadband Plans in Latin America', report prepared for: Centro de Investigación y Docencia Económicas A.C., December, No. 274.*

# Philippines

## The state of telecommunication and ICT provision, use and policy

- Regulator: National Telecommunications Commission (NTC) - Revised legislation to create a new Department of Information and Communications Technology (DICT) was proceeding in early 2015.

### **Market structure (level of competition)**

- Competition in all telco segments
- While the telecom sector in the Philippines has witnessed considerable investment and business activity since deregulation gained momentum from 1993, the market has continued to fall short of its full potential. PLDT had been the private monopoly holder prior to this.

### **Mobile market**

- 114 per cent mobile subscription penetration
- 45 per cent using the internet
- The Philippines mobile market took off in 2000, with the rapid uptake of SMS as a means of communications. At its peak, around two billion SMS messages were being sent every day in the Philippines. While the SMS market has recently declined with the uptake of internet-based social media, the country reportedly continues to generate the largest SMS volume in the world.
- There is poor connectivity particularly in rural areas where return on investment concerns have curtailed 3G or 4G network rollout.
- The penetration of smartphones in the Philippines is behind other Southeast Asian countries (15 per cent compared to Indonesia 23 per cent; Thailand 49 per cent; Malaysia 80 per cent; and Singapore 87 per cent).
- In early 2015 BellTel entered the Philippines mobile market as the fourth mobile operator (others are PLDT, Globe and ABS-CBN Mobile).
- Smart was leading the deployment of 4G LTE mobile services across the country, with its 4G network covering more than 85 per cent of the population.

### **Home access (computer and internet)**

- 18.7 per cent of households have a computer at home
- 22.9 per cent of households have Internet access at home
- The country's fixed-line subscriber penetration remains low and stagnant. Despite the effort of both the government and the operators to expand the national fixed network, fixed-line teledensity stood at just 3 per cent in 2015; a little more than half of all Philippine towns and cities had a basic fixed telephone service at that stage.
- Compared with most of its Asian neighbours, the Philippines has moved slowly on the adoption of Internet. Broadband is finally building a subscriber base. There has been good progress in the rollout of optical fibre, although not on the national scale envisaged. Instead broadband connectivity has been boosted by the considerable presence of mobile broadband services. While there are over 8 million broadband subscribers this still only represents 8 per cent population penetration.

### ***National policy framework***

- The Philippine Digital Strategy (2012-2016) and the National Broadband Plan has provided set targets for the provision of basic access to the Internet, with the goal to achieve seamless connectivity between government, business and the home. The government has attempted to implement the National Broadband Plan through a multi-stakeholder process.
- The “E-Government Master Plan: Where We Are Now?” and the “Government Network: Faster Delivery of Services to Citizens” addressed the state of government services in relation to the Free Wi-Fi Project. These programs will be augmented by the Free Wi-Fi Project’s planned infrastructure and interlocked by the Project’s final goal of Digital Empowerment. These were launched in July 2015 as part of National Science and Technology Week.

### ***Telco funding opportunities (USOF)***

- Has no USOF (2013)

### **Public wi-fi developments**

- The Juan Konek! Digital Empowerment Program’s Free wi-fi Internet Access in Public Places project of the Department of Science and Technology’s Information and Communications Technology (ICT) Office is set to bring Internet connectivity to class 4, 5, and 6 municipalities in the country. It recently received a three billion peso upgrade from the Senate and will be a nationwide project. Sec. Montejo hopes to provide free wi-fi internet access in select public spaces in the country to include: public plazas and parks, public primary and secondary central schools, public libraries, rural health units and government hospitals, state universities and colleges train stations of the MRT and LRT systems, airports and seaports city and municipal halls and national government offices. According to DOST, once fully deployed, the project will serve 105,000 concurrent users with an average speed of 256 kbps each. It will be subjected to data volume based Fair Usage Policy to promote an equitable distribution of the public service.
- In order to address issues surrounding the ‘digital divide’ the Philippines government will deploy satellite technology to help speed up access for remote and low income areas. It is hoped that such an initiative will enhance connectivity penetration and smartphone uptake.

# Republic of China (Taiwan)

## The state of telecommunication and ICT provision, use and policy

- Regulator: Technologies Administration Department for Infrastructure Sharing and Planning  
Department for LLU of NCC

### **Market structure (level of competition)**

- Chunghwa Telecom's Optical Era Project will see investment of US\$1.8 billion to construct an island-wide fibre-optic network over five years. The company aims to have 97 per cent of its broadband network capable of speeds over 100Mb/s by 2016.
- Taiwan has one of the most advanced telecommunications networks in Asia. With excellent telecommunications infrastructure in place, continuing infrastructure investment and the innovative use of breakthrough information technologies, the country continues to be well placed to drive both mobile and data communications services.

### **Mobile market**

- 127 per cent mobile subscription penetration
- 80 per cent using the internet
- Although expansion of the mobile subscriber base has stalled revenue growth has remained strong as users rapidly switch to new technologies. Subscriptions to 3G have grown rapidly on the basis of rising competition and the expansion of handset and applications availability. By 2013 3G accounted for 90 per cent of all subscriptions with the rapid uptake of smartphones subsequently driving data revenue – it now accounts for more than 35 per cent of total telecom service revenue. In 2014 4G services were launched.
- Mobile broadband is driving more vibrant online commerce, entertainment and advertising to 2015 and in particular mHealth.
- LTE licensing set to take place in 2014 following completion of spectrum auction. (Taiwan will remain the only major market without LTE in region for the next few years.)

### **Home access (computer and internet)**

- The Taiwanese market has rapidly become a significant player in broadband internet access. By 2013 broadband penetration had exceeded 100 per cent (fixed-line and mobile services combined) with fibre connections the dominant access technology.

### **National policy framework**

- Taiwan has a framework in which to implement universal services to bridge the 'digital divide' between rural and urban areas. In 2008 government project working with private telecommunication companies, *Broadband for Villages* was launched and rolled out in three provinces; with the government expecting a further rollout to include outlying islands and tribes.

### **Telco funding opportunities (USOF)**

In 2006 Taiwan broadened its universal service obligation to include broadband in uneconomic areas.

## Public wi-fi developments

- Taiwan was an early adopter of public wi-fi. In 2004 Taipei launched a municipal wi-fi project (WiFly) as a partnership between Taipei City Government and two commercial hardware and network

developers. By 2006 there were approximately 4,000 access points deployed with a coverage of 2.3 million people. Pre-dating tablet and smartphone device technology, this early development had little use, with some estimates of 30,000 regular logins.

- In 2011, Taiwan rolled out a 6 month free wi-fi hotspot trial across the country with 2,500 spots.
- By 2012, major mobile telco, Far EastOne Telecommunications planned to roll out 36,000 hotspots for its mobile users (up from its then current 25,000 hotspots). The company's executive director Jeffrey Gee stated that this was a concerted push to offload traffic onto the wi-fi network.
- In 2013, the company partnered with Atilo Networks – a company that specialises in enabling wi-fi offloading.
- Tourists in Taipei are able to access free wi-fi in selected outdoor and indoor spots after registering an account at a Visitor Information Centre.

# Russia

## The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry for Communications and Informatisation of the Russian Federation (Minsvyaz)

### **Market structure (level of competition)**

- MARKET STRUCTURE Competition across some/all telco segments
- Russia's huge and fully liberalised telecom market is supported by a population of about 143 million. The market is dominated by the western regions where the main cities and economic centres are concentrated. Efforts continue to be made to improve infrastructure in remote areas, where many smaller towns still lack mobile or internet services.

### **Mobile market**

- 153 per cent mobile subscription penetration
- 61 per cent using the internet
- Russia has the largest mobile market in Europe and a penetration rate of about 170 per cent. Although a number of operators offer services, the market is dominated by three major players that expanded nationally through the acquisition of smaller regional carriers.
- The deployment of HSPA and LTE networks presents a new growth opportunity through the offering of mobile broadband services.

### **Home access (computer and internet)**

- 69.7 per cent of households have a computer at home
- 67.2 per cent of households have internet access at home

### **National policy framework**

- Russia plans to make 100 Mbps, or Ultra-Fast Broadband (UFB), available to 80 per cent of Russian residents by 2018, with the ultimate goal of providing accessible and affordable broadband to 95 per cent of households by 2020.

### **Telco funding opportunities (USOF)**

- No USOF info

## Public wi-fi developments

- In 2009, Russian mobile operator Vimpelcom rolled out 16,000 wi-fi hotspots across 40 cities at a cost of USD\$24 million. It had approximately 100,000 active users at the time. It was part of an earlier (2007), ambitious plan by Golden Telecom (that was later bought out by Vimpelcom) to have Moscow, the largest wi-fi network in Europe and second largest in the world.
- Moscow Metro tenders for Wi-fi contract across its network;
- In 2014, the Russian government made a contentious decision requiring all public wi-fi users to provide identification. It was part of a large crackdown on what was traditionally a largely unregulated internet space. The identity checks were part of the state's 'terrorism and security' regulations.

# Singapore

## The state of telecommunication and ICT provision, use and policy

- Regulator: Infocomm Development Authority of Singapore (IDA)

### **Market structure (level of competition)**

- Competition in all telco segments
- With strong leadership from its government, a progressive regulatory environment and good support from its telecom service providers, Singapore is both a regional leader and a global player in telecommunications with a highly competitive local market. The nation is determined to maintain its status and in the process it has been embarking on new and innovative telecom and IT projects. Typical of this emphasis on taking the lead, in 2014 SingTel and Huawei agreed to collaborate on 5G research and trials.
- Although incumbent Singapore Telecommunications (SingTel) continues to play a major role in the local telecom sector, liberalisation has seen a significant number of new operators entering the market, helping to exploit the competitive situation. Singapore had one of the lowest mobile prices in the world as a proportion of income, according to the ITU's ICT development index.
- The arrival of strong competition in its own backyard saw SingTel expand offshore and, in what eventually turned out to be a successful strategy, the company has been able to establish a considerable presence in regional markets, including 100 per cent ownership of Optus, the second ranked mobile operator in Australia. Its offshore presence includes subsidiaries in India, Indonesia, the Philippines, Thailand, Pakistan and Bangladesh. Through its alliance with Bharti Airtel in India it has further market presence in Bangladesh, Sri Lanka and Africa.

### **Mobile market**

- 156 per cent mobile subscription penetration
- 73 per cent using the internet
- Singapore's 3G market segment has been on a growth surge over recent years but by 2014 it had already moved into decline with the advent of 4G.
- By August 2014 there were already 2.8 million 4G subscribers, this being a remarkable 50% population penetration rate.

### **Home access (computer and internet)**

- 86 per cent of households have a computer at home
- 86 per cent of households have internet access at home
- Singapore's fixed-line household penetration rate is around 100 per cent with many Singaporeans having two fixed telephone services at home.
- The Residential Wired Broadband Household Penetration Rate, for example, had reached around 108 per cent by mid-2014.

### **National policy framework**

- In 2008 the IDA announced a USD725 million government investment to support development of a national optical fibre-based network as part of what was called the Next Generation National Infocomm Infrastructure (Next Gen NII). The strategy also included a wireless network. Despite slow rollout rates by 2014 the rate of take up of fibre-based services was impressive.

### ***Telco funding opportunities (USOF)***

- Has no USOF (2013)

### **Public wi-fi developments**

- As part of the 'Intelligent Nation Masterplan (iN2015) in 2013, the new phase of the Wireless@SG programme saw an increase in access speeds for Singapore's free public wi-fi with estimates up to 2 Mbps. The push was for the development of seamless transition from carrier to wi-fi data.
- Inter-operator roaming will begin by the end of this month, enabling users to access the internet network island-wide.
- Like measures brought in in Russia, Singapore invested in SIM-based authentication 'to simplify the wireless login process'. Singaporeans have a one-stop access to over 400 government e-services via the eCitizen portal, and some 100 mobile government services via the mGov@SG mobile app. Singaporeans are also able to have quick access to letters from government ministries and agencies via their secure digital mailbox, OneInBox.
- Skyfii 2014 entry (pri-fi data mining) - With Indonesia having a vast population with a strong appetite and acceptance of free Wi-fi services, we see our expansion into the country as a natural fit for the Company."
- Joint agreement with Brunei, Indonesia and Malaysia to share the 700MHz bandwidth.
- Singapore is regarded as a leader of wireless infrastructure in the region.
- In 2015, telco Singtel will trial a wi-fi calling plan where customers will be able to make calls from either their own wi-fi or public wi-fi hotspots with seamless transitions being the key to its success.
- In 2015, the Infocomm Development Authority (IDA) launched the 'Smart Nations Innovations 2015' event. It was announced that there would be a major rollout of a plan in two phases with the ultimate goal being 100% connectivity, 100% of the time for all Singaporeans on the island through an initiative called: HetNet (abbreviated from Heterogeneous Network). The trial will start in the latter half of the year beginning at the Jurong Lake district and will focus on areas not traditionally earmarked for public wi-fi access points such as lifts and void decks.
- The proposed plan will included sensors for fitness trackers, smartwatches and other wearable technologies. Sensors placed across the city will be constantly transmitting all kinds of data, including communication, health, entertainment, traffic. They will all need to talk to each other, and to their own providers, whether to inform, for example, a person's doctor of their heart condition or to alert the authorities of possible traffic congestion. Interoperability and compatibility will be key factors in all this stream of data reaching its intended destination.
- The IDA states that all three telcos — Singtel, StarHub and M1 — and fibre broadband service provider MyRepublic will be involved in the trial.

# South Korea

## The state of telecommunication and ICT provision, use and policy

- Regulator: Korea Communications Commission (KCC)

### **Market structure (level of competition)**

- Competition in all telco segments except Partial competition in Mobile, IMT (3G, 4G, etc.), Fixed Wireless Broadband, Cable Television (data is 2010)
- South Korea has one of the world's most active telecommunications and Information Technology markets backed by strong support from the government.
- Having invested significantly in 'basic' telecommunications infrastructure over past decades, the country now possesses well-developed national and international communications infrastructure.
- South Korea's operators have invested heavily in fibre based broadband deployments, laying the foundations for triple play services.

### **Mobile market**

- 111 per cent mobile subscription penetration
- 85 per cent using the internet
- South Korea continues to be a booming mobile market as it rapidly takes up LTE and innovatively explores the options for value-added services. Strong LTE demand was supported by new LTE plans and introduction of more smartphones into the market resulting in ARPU trending upwards. 4G LTE now represents the majority of mobile connections after it was introduced in 2011. There has also been a rapid increase in mobile traffic, with potential profitability challenges ahead as operators are forced to spend on upgrading network capacity while at the same time reduce tariffs in response to competition.

### **Home access (computer and internet)**

- 80.6 per cent of households have a computer at home
- 98.1 per cent of households have internet access at home
- South Korea has the world's highest number of broadband services per capita. Into 2015 approximately 40 per cent of the population and around 95 per cent of households were broadband subscribers. Into 2015, fibre technology accounted for almost 60 per cent of all broadband subscribers in South Korea while ADSL subscriptions had declined to less than 10 per cent, the remainder is due to cable modem subscribers.

### **National policy framework**

- Government involvement continues with the aim of transforming the country into a knowledge-based information society in a 'smart-age'.

### **Telco funding opportunities (USOF)**

- No USOF info

## Public wi-fi developments

- Congestion has led to offload investments in Wi-fi and WiMAX.
- In 2011, Seoul had no wi-fi access to more than 83% of its outdoor areas. But with the rapid uptake of smartphones and tablets at that time, the government launched a US\$44 million project with the three larger telcos investing the funds to roll out the wi-fi infrastructure that was first initiated on public transport, including taxis.
- In 2013, the government launched a new plan to roll out wi-fi to remote communities, with particular focus on public health and welfare places and community centres. It stated that this was imperative to help alleviate the costs associated with mobile technology for users. At the time of the launch of the new plan, 53% of the public wi-fi spots were located in Seoul alone.
- The Nation's capital, Seoul offers tourists free Instagram access via the public wi-fi service which is a government run free public wi-fi initiative with over 10,000 hotspots scheduled to be in place by the end of 2015 (there are many more free public wi-fi access points other than this specific initiative).

# Thailand

## The state of telecommunication and ICT provision, use and policy

- Regulator: The National Broadcasting and Telecommunication Commission (NBTC)

### **Market structure (level of competition)**

- MARKET STRUCTURE: Partial Competition - Local Fixed Line Services C\*, Domestic fixed long distance C\*, International Fixed Long Distance C\*, Mobile P\*, IMT (3G, 4G, etc.) P\*, Wireless Local Loop P\*, DSL C\*, Cable modem P\*, Fixed Wireless Broadband C\*, Leased Lines C\*, International Gateways C\*, Internet Services C\*, Cable Television C\*, Fixed Satellite Services (FSS) C\*, Mobile Satellite Services (MSS) P\*, VSAT P\*.
- More than 99 per cent of the market-share belong to three large operators. The once all-powerful duopoly - AIS and DTAC – still dominates the market despite the challenge of the other players. In reality, number three in the mobile market, True Move, was the only one to challenge the big two in any fashion. Other operators include the state enterprises TOT Public Company Limited (TOT) with 0.57 per cent market share, and CAT Telecom with 0.15 per cent market share.

### **Mobile market**

- 147 per cent mobile subscription penetration
- 39 per cent using the internet
- Majority of mobile subscribers are pre-paid.
- In 2013 3G introduced and rapid migration of users to that service – approx. 80 per cent of current mobile subscribers. 4G LTE introduced in 2013, but only represents less than 2 per cent of market. Auction of additional 4G spectrum due in late 2015 with new services expected in 2016.
- Operators are looking at a variety of delivery methods to augment internet penetration. The burgeoning mobile market in Thailand ensured that mobile phones, as well as set-top boxes, were high on the list of potential delivery devices. At the same time, the cybercafe in its different forms had already established itself as a key element in the country's access equation.
- Most importantly, with 3G and even 4G services being rolled out in a significant way, mobile broadband and the smartphone and tablet market is booming. 2014 claims that 90 per cent of 18-24 year olds access the internet via mobile phone. Social media is a significant driver of internet activity.

### **Home access (computer and internet)**

- 28.7 per cent of households have a computer at home
- 22.7 per cent of households have internet access at home
- Fixed line penetration is less than 9 per cent of population and less than 6 per cent in rural areas.
- The Thai internet market has been continuing on a growth path over the last number of years. Thailand still has a lot of development work to do to catch up to some of the other countries in the region.

### ***National policy framework***

- The Thai telecom industry has experienced a stop-start approach to sector reforms and deregulation. An important step was taken with the Telecommunications Act being adopted as law in 2000, but successive governments have moved slowly on its implementation. A range of deregulation issues are still to be addressed. One of the big structural reform issues – the defining of the roles and the restructuring of state telecommunication enterprises TOT and CAT demands urgent attention.

### ***Telco funding opportunities (USOF)***

- USOF is 4 per cent total gross revenues all operators (turnover)

### **Public wi-fi developments**

- The ministry kicked off the first phase of the nation's free public wi-fi service with 10,000 spots nationwide in late December 2011, such as in public areas, city halls, airports and inter-provincial bus stations. The Information and Technology Ministry targeted under this plan to expand the service to cover total of 250,000 spots nationwide by 2017.
- By 2012, the government launched a 'Smart Thailand' plan that included the expansion of wireless technologies, in particular, public wi-fi in remote areas. There was a pilot program called 'Smart Province' launched in Nakhon Nayok. Part of this pilot project was a requirement of the private sector to provide free wireless internet services that would benefit both locals and tourists visiting the area.
- 2012 also marked a number of other free (or low cost) wi-fi services throughout the country. The ICT Ministry will initiate free Wi-fi projects in collaboration with service providers, to offer the service in remote areas - called the last-mile areas - where fibre optic networks have not reached, and in cities throughout the country.
- In the initial phase, the project aimed to have 20,000 wi-fi hot spots at public areas such as airports, public transportation venues, government offices, and universities. It was earmarked to be provided by TOT Corporation and CAT Telecom. The next phase aimed to welcome private sectors to join the project and have 250,000 free wi-fi hot spots throughout the country by 2017.

# United States

## The state of telecommunication and ICT provision, use and policy

- Regulator: Federal Communications Commission (FCC); National Association of Regulatory Utility Commissioners (regulators of individual states) (NARUC); CTIA – The Wireless Association (CTIA)

### **Market structure (level of competition)**

- MARKET STRUCTURE: Competition in all telco segments
- The US broadband market is currently witnessing significant investment activity in fibre deployments, HFC upgrades and mobile broadband network rollouts.
- Broadband services in most regions still lack effective competition, with the AT&T and Verizon managing an effective duopoly in many areas of the country.
- Municipal activity, often geared at breaking this stranglehold and introducing competition and innovation, continues to be stymied by lobbying pressure from these main telcos, which has led to at least 19 states banning or restricting municipal or state-led infrastructure projects. Much of the investment in fibre is being undertaken by a significant number of smaller players and municipalities rather than the two key telcos, which are concentrating on a hybrid fibre/copper network.

### **Mobile market**

- 96 per cent mobile subscription penetration
- 84 per cent using the internet
- Mobile data use remains strong in line with the fast development of LTE networks and the high take-up of smartphones, which now account for about 80 per cent of all handset devices on mobile networks.

### **Home access (computer and internet)**

- 80 per cent of households have a computer at home
- 77.3 per cent of households have internet access at home

### **National policy framework**

- There is now a growing consensus, supported by the President in his 2015 State of the Union address (that intimated an end to state legislation banning municipal broadband networks), that such restrictions should be lifted. The FCC Chairman in February 2015 proposed measures which would reclassify broadband as a telecom service rather than a content service, and would extend network neutrality conditions to mobile broadband services. The FCC is also determined to use its authority to override restrictive state laws.

### **Telco funding opportunities (USOF)**

- USOF The Commission has designated the Universal Service Administrative Company (USAC), an independent, not-for-profit corporation, as the administrator of the federal Universal Service Fund (see <http://www.usac.org/default.aspx>). Gain fees from Telecommunications carriers and certain other providers of telecommunications that provide service between states and internationally must pay a specified percentage of their interstate and international end-user revenues into the Universal Service Fund. This percentage is called the "contribution factor". The contribution factor changes four times a year (quarterly) and is increased or decreased depending on Universal Service program demand and the revenues reported by contributors.

## Public wi-fi developments

- Public wi-fi development in the United States has been characterised by private companies seeking to inhibit free public wi-fi initiatives. Most notably were the wireless mesh network set up post hurricane Katrina in New Orleans (set up to provide emergency access) with incumbent providers (who were still struggling to re-establish) seeking to curb and dissuade local government support for its continued existence; as well as the broader national free public wi-fi plan that had been in talks for many years. Under the proposal, the FCC would provide free, baseline Wi-fi access in ‘just about every metropolitan area and in many rural areas’ using the same air wave frequencies that empower AM radio and the broadcast television spectrum. Under the plan, local television stations would sell a chunk of their air wave spectrum rights to the government. Those frequencies would be used for public wi-fi networks.
- Many of the major providers already provide ‘free’ public wi-fi to their customers. However, there is no universal access and the free public wi-fi proposed by the FCC seeks to rectify that.
- The term ‘muni-wifi’ refers to the mesh wi-fi networks set up in towns to provide free public wi-fi. Again, these initiatives are openly scorned by private corporations, telcos and lobbyists.
- In 2015, Google launched ‘Sidewalk Labs’ which proposes to bring free public wi-fi to the streets of New York City. It is part of a larger push by Google to have a system of cities globally linked with free public wi-fi under the more ambitious scheme ‘Intersection’.
- Republic Wireless, a US based company sells mobile phones that will first access wi-fi to make calls, falling on the telco Sprint, if no wi-fi is available.

# Vietnam

## The state of telecommunication and ICT provision, use and policy

- Regulator: Vietnam Telecommunication Authority (VNTA); Ministry of Information and Communications

### **Market structure (level of competition)**

- MARKET STRUCTURE: Competition in all telco segments except monopoly in mobile and fixed satellite
- Vietnam has for some years now been aggressively expanding its national infrastructure and growing its subscriber bases across all market segments.
- A general process of rationalisation has clearly been taking place in the market.

### **Mobile market**

- 131 per cent mobile subscription penetration
- 44 per cent using the internet

### **Home access (computer and internet)**

- 19 per cent of households have a computer at home
- 17.1 per cent of households have internet access at home
- The excellent national coverage of fixed-line infrastructure achieved is valuable but the fixed-line telco market segment has declined.
- The internet market, and particularly the roll-out of broadband internet, was still in a relatively early stage of development. The major push is in mobile rather than fixed line broadband.

### **National policy framework**

- Over the years Vietnam's progress on regulatory reform in the telecom sector has moved along in an erratic fashion. Certainly good progress was made in the lead up to WTO accession in 2007, but many initiatives subsequently stalled. By 2014 the government was finally addressing the restructure of the incumbent state owned telco - VNPT.

### **Telco funding opportunities (USOF)**

- USOF - 1 to 3 per cent (highest for Mobile)

## Public wi-fi developments

- In 2014, the coastal city of Da Nang after a year long trial officially launched wi-fi coverage over its territory. It was introduced to promote tourism and to help build 'smart urban infrastructure'. Initially it will be a free service until the end of 2016, after which, users wanting a better connection will have to pay a fee.
- The central city's Information and Communications (IC) department in co-operation with Sai Gon Post and Telecommunication (SPT) Company has developed a digital marketing service, the S-wi-fi, for public wireless users. The S-wifi, developed on the World Bank-funded Information Technology infrastructure system in Da Nang city, allows 40,000 connections on the wireless public marketing service. This service is available in Ho Chi Min City and Can Tho respectively as well as in Dan Nang.