Implementing the e-APEC Strategy: progress and recommendations for further action

Background Paper

PART ONE

ASSESSING E-INFRASTRUCTURE IN THE APEC REGION

November 2004

This document is a background reference paper for the PECC report to APEC Ministers in Santiago entitled *Implementing the e-APEC Strategy: progress and recommendations for further action*. It is included in a CD accompanying the published Overview Report.

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1. Assessing e-infrastructure

1.1 The scope of e-infrastructure

E-infrastructure provides access. Must be flexible to handle different services

E-infrastructure is basic to an e-economy because it provides the means for *access.* Access should be viewed from two distinct but complementary perspectives. First, for end-users, e-infrastructure provides access to the electronic communication networks and thus e-activities/service applications. Second, for e-activities/services providers, e-infrastructure provides access to end-users/customers and consequently the opportunity to utilise e-based services. Due to the fact that many e-activities/services possess different characteristics and bandwidth requirements, it is also essential for e-infrastructure to have the flexibility to handle e-activities/services with equal efficiency.

Fixed line, mobile & cable most available. Satellite, fibre optics & wireless emerging

In the light of rapid network convergence, the most publicly available e-infrastructure across the APEC region now includes fixed-line PSTN (Public Switched Telecom Network), mobile networks and cable (CATV) networks. Emerging infrastructure, such as satellite, fibre optics to home (FTTH), WAN (wide area network), or WiFi (wireless LAN), either lack mass market up-take or are in an early stage of development. Nevertheless, they represent an important market trend and could play a vital role in the near future. In this section, the development of the three primary e-infrastructures of fixed-line PSTN, mobile and cable networks are assessed.

Table 1 The general characteristics of e-infrastructure

Networks	media	Max. Bandwidth Capacity	Market adoption
Fixed-line PSTN	Copper wire + fibre optics	51.8 Mbps downstream; 2.3 Mbps upstream (VDSL)	Mass
Mobile	Radio frequency	2 Mbps (3G)	Mass
Cable (CATV)	hybrid fibre coax (HFC) cable	30-40 Mbps	Increasingly mass
Fibre-to-the home (FTTH)	Fibre optics	100 Mbps to 1Gbps (1000 Mbps)	Limited
LAN and WAN	coaxial cable or fibre optics	100 Mbps to 1 Gbps	Limited
WiFi	Radio frequency	54 Mbps	Limited
Satellite	Radio frequency	34 Mbps (One way only)	Limited

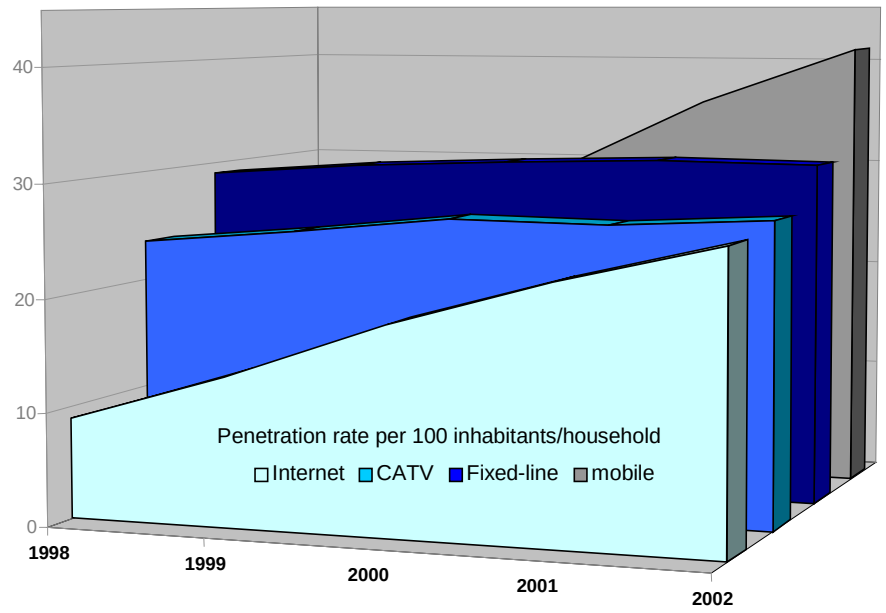
1.2 Accessibility of e-infrastructure[1]

(1) Overview

Access in APEC is above world average. Mobile and internet most outstanding.

The accessibility of e-infrastructure in APEC economies has improved significantly in recent years. The most remarkable development is the enormous expansion in mobile and Internet accessibility particularly in economies with low penetration rates in the past. Figure 1 illustrates the basic trend in accessibility growth in APEC economies. At the end of 2002 the average penetration for fixed-line PSTN network per 100 inhabitants in the APEC region reached 31, which is well above world average of 17.9. Cable penetration was 27 per 100 TV household, which is lower than world average of 31.8. Mobile penetration exceeded 40 %, which is again significantly higher than the world average of 19. The basic growth pattern for fixed-line and cable is a slow but steady growing slope, while sharp increases have been recorded in mobile and Internet sectors.

Figure 1 Trend of accessibility growth in APEC region



Note: Penetration rate for cable is calculated as per 100 household equipped household.

Source: ITU, 2003

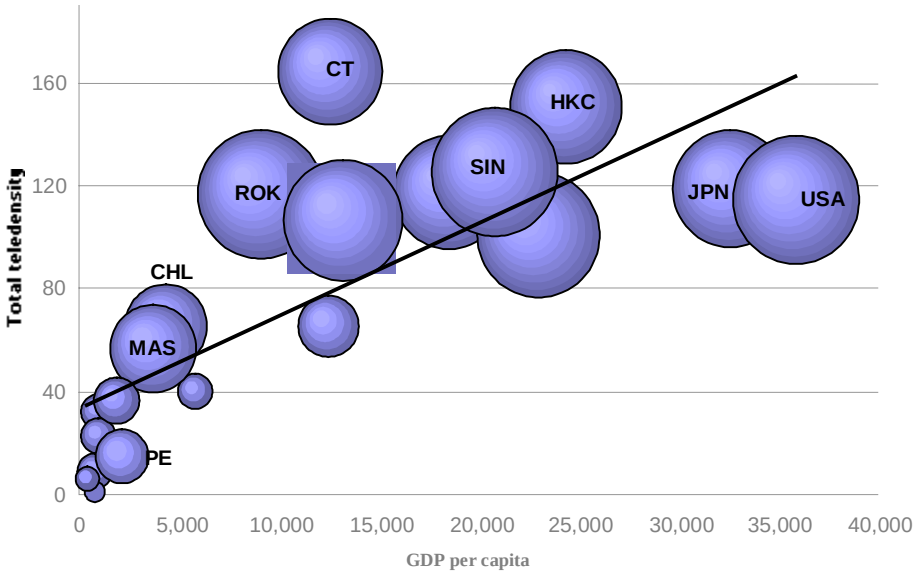
[1] Raw data used throughout this report is supplied mainly by the ITU Telecom Database. Although every effort has been made to ensure that the data are up-to-date, the researchers understand that information for some member economies has not been updated. Given the speed of ICT development, some assessments made in this report might underestimate actual situations in some economies especially in the Internet and mobile sectors.
This nonetheless does not affect the report's ability to reflect the overall and general trend of development and performance in the region.

Total teledensity & number of internet users rises with GDP per capita as expected.

Figure 2 presents the more specific relationship between total teledensity[2] and the number of Internet users with GDP per capita of APEC economies at the end of 2002. Economies with higher average income tend to have a higher teledensity as well as Internet users with the exception of especially Hong Kong and Chinese Taipei. In general, developing APEC economies have still relatively less availability in terms of e-infrastructure compared to their developed counterparts.

Many factors might contribute to this outcome. First, developed economies usually have a higher market demand for communications services[3]; second, lack of financial as well as technical support might result in delaying infrastructure developments in developing economies, and finally, a lack of a predictable policy/regulatory environment affects investments in e-infrastructure expansion.

Figure 2 Teledensity, Internet users and GDP per Capita



Note: Size of bubble represents the number of Internet users per 100,000 inhabitants

Source: ITU, 2003

Growth in teledensity shows developing APEC economies moving forward rapidly.

The traditional way of comparing teledensity with the corresponding level of economic development cannot adequately capture the dynamic expansion of e-infrastructure initiated by both public and private sectors especially in developing APEC economies.

[2] Total teledensity is calculated by adding fixed telephone lines penetration rate and mobile penetration rate.

[3] The terms 'developed' and 'developing' used in this report follows in general the classification system adopted by the International Monetary fund (IMF). The terms are based on loosely defined criteria and serves for the sole purpose of facilitating data organization.

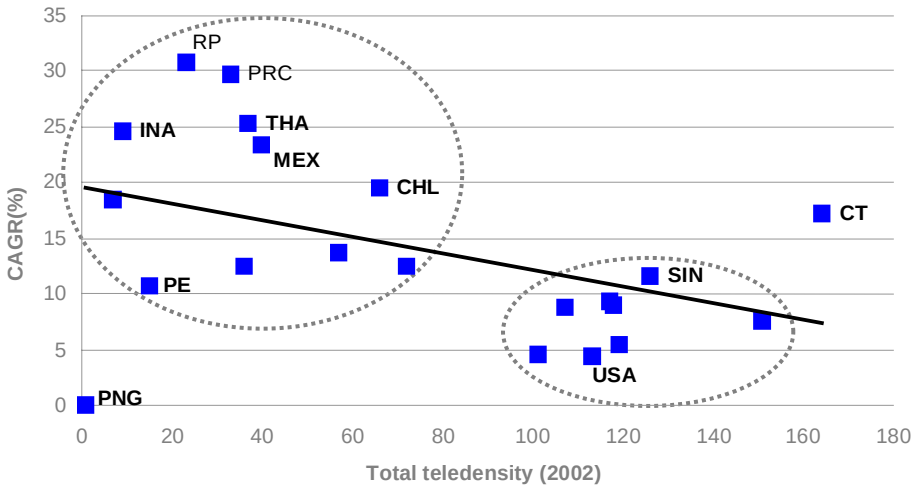
CAGR or compound annual growth rate gives a clearer picture of how teledensity is growing

By comparing total teledensity with its compound annual growth rate (CAGR)[4], Figure 3 shows the trend from 1997-2002 in e-infrastructure growth on an economy basis. Most developing economies, such as the Philippines, Chile, China, Indonesia, Mexico and Thailand, have significantly improved their accessibility conditions during the last 5 years with an average compound annual growth rate exceeding 20 %. The only exception is PNG where a zero growth rate is recorded. Developed economies on the other hand tend to have a relatively limited growth rate with the exception of Chinese Taipei.

Growth in demand & improving policy environment has helped developing economies

This trend is plausibly associated with the growing market demand in developing economies and the fact that infrastructure has been under-developed in the past. It is also evident that liberalization policy as well as a pro-competition and pro-investment regulatory environment, adopted by most economies in recent years, has facilitated the expansion of infrastructure.

Figure 3 Compound annual growth rate and total teledensity among APEC economies



Source: ITU, 2003

(2) Development in fixed-line telecommunications network

Fixed lines remain crucial for access. New technologies have helped.

Although communication traffic has been shifting from voice to data, fixed-line PSTN networks remain one of the most important e-infrastructures. The accessibility of fixed-line PSTN networks affects not only the provision of traditional voice services such as local and long distance telephony, but also

[4] Compound annual growth rate (CAGR) is calculated by the formula:

$$\left[\left(P_v / P_0\right)^{(1/n)}\right] - 1$$

where P_v = Present value

P_o = Beginning value

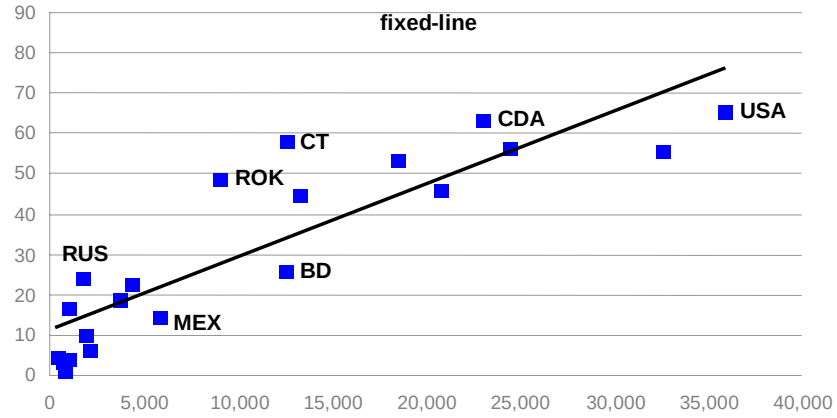
n = Number of periods

other value-added services it supports. With the advancement of broadband Internet access technologies such as Digital Subscribers Line (DSL), that have evolved based on PSTN configurations, PSTN networks still remain the primary e-infrastructure in the APEC region as least for the near future.

Big variations in penetration rates remain in APEC.

Significant variations in access to fixed-line infrastructure still exist across the APEC region on a per capita basis. Figure 4 shows that the conditions for access in APEC economies are, in general, a function of their level of economic development. Some economies, for example Canada, Chinese Taipei, Korea and Russia, have a better performance in relation to their respective level of economic developments.

Figure 4 Fixed-line density per 100 inhabitants GDP per capita



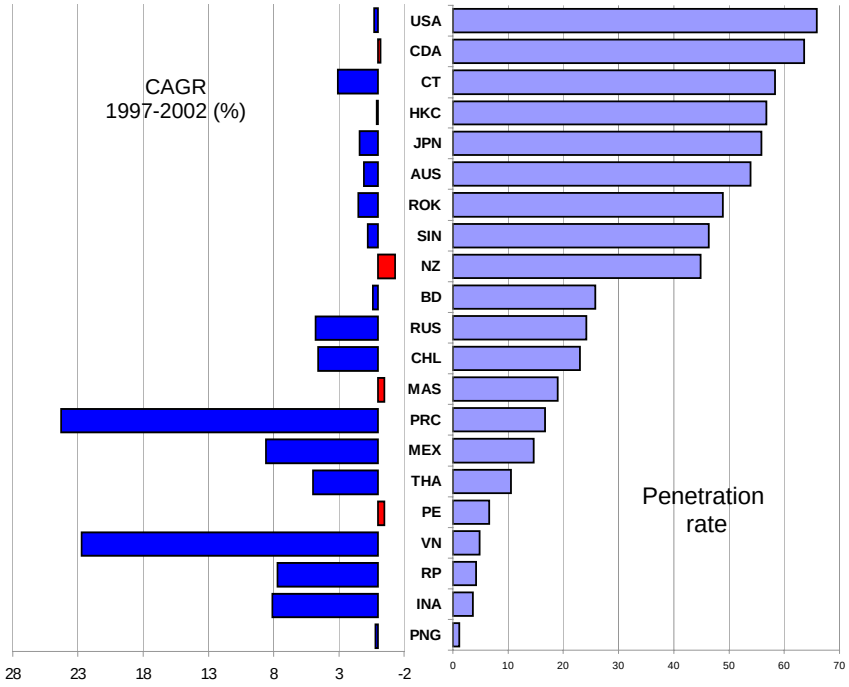
Source: ITU, 2003

Annual fixed line growth faster in developing APEC economies. Saturation point in developed economies

Fixed-line networks in most developed economies have reached a saturation point with very limited annual growth. On the other hand, in most developing economies rapid catching-up efforts are taking place. Figure 5 demonstrates the status of fixed-line accessibility in the APEC region. While still low, most developing economies enjoyed a compound annual growth rate of at least 5% between 1997 and 2002. There was a strong performance in China and Vietnam where compound annual growth rate exceeded 20 % during the 5-year timeframe. There are however a few exceptions: for example, New Zealand, Malaysia and Peru, had a negative compound annual growth rate during those five years.

The result is then multiplied by 100 to obtain a percentage.

Figure 5 Penetration rate and compound annual growth rate (CAGR)



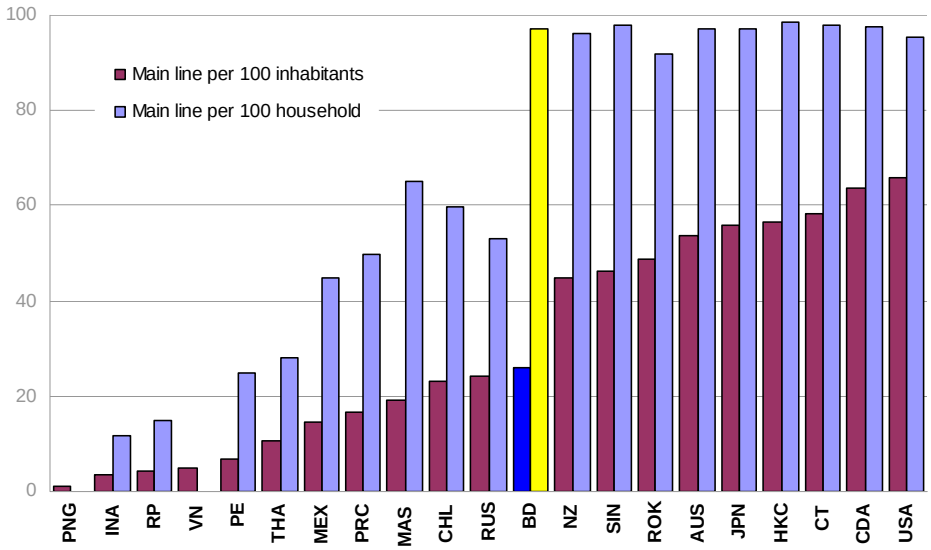
Source: ITU, 2003a

Teledensity on a household basis shows a better picture for APEC economies. More people have access.

There are several shortcomings of calculating teledensity on a per head basis. The main issue, as noted by ITU (2003b), is that it could distort the actual status because of variations in demographic distributions. Economies with large household size might enjoy an equal level of accessibility to fixed-line networks when identified on a per-household basis.

Measuring per household teledensity provides a different perspective on fixed-line accessibility in the APEC region. The evidence shows that economies with a fixed-line teledensity rate exceeding the 40 mark have basically achieved a household penetration rate approaching 100, i.e. every household in the economy has access to at least one phone line. In addition, economies with relatively low teledensity on a per capita basis, including Brunei, Chile, China, Malaysia, Mexico and Peru, have a much better accessibility performance based on per household calculation. The most obvious example can be drawn from Brunei, which enjoys accessibility reaching 100 compared with just 25 if measured on a per capita basis.

Figure 6 Teledensity per capita and per household (2002)



Note: No data available for PNG and Vietnam on per household calculation.

Source: ITU, 2003

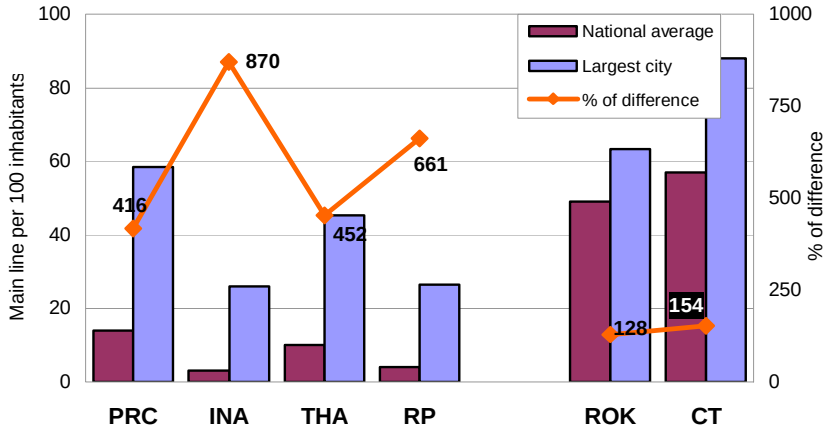
Big disparities in fixed line access between urban and rural areas in some APEC economies.

The most critical policy issue with fixed-line accessibility facing developing economies in particular is perhaps the uneven distribution of infrastructure resources between urban and rural areas. In most circumstances, development is centred in metropolitan areas with a significantly higher-than-average penetration rate.

Figure 7 demonstrates actual situations in selected APEC economies. For example, Indonesia's fixed-line penetration rate was only 3 per 100 inhabitants at the end of 2001; but the penetration rate in the capital (also largest) city Jakarta is around 8.7 times higher than the national average, reaching 26 phone lines per 100 inhabitants. Similar situations can also been found in China, Philippine and Thailand. In comparison developed economies (Korea and Chinese Taipei in this case) tend to have more evenly distributed infrastructure resources. Several policy considerations are required to tackle this; including a well-defined and effectively implemented universal service regime to bring forth a more balanced distribution of infrastructure resources.

Policies required to tackle disparities between urban and rural access.

Figure 7 Comparison of main line penetration rate in largest city with national average in selected APEC economies (2001)



Source: ITU, 2003a

(3) Development in mobile network

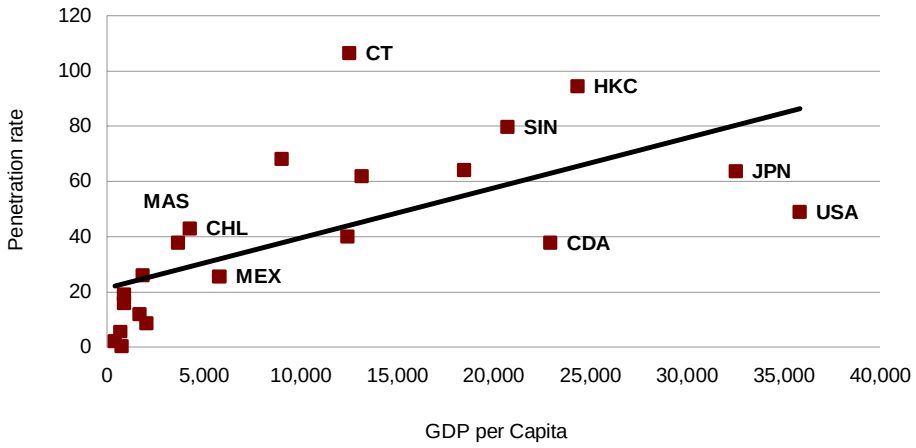
Mobile sector performance in APEC is outstanding.

Performance in the APEC mobile sector is breathtaking. Contributing factors include relatively low network deployment costs, less policy sensitive issues, high market demand and an increasing variety of services. With the launch of 3G mobile service that promises an access speed up to 3 Mbps, mobile services are fast shifting from voice to multimedia applications.

Some APEC economies have higher mobile penetration than fixed line.

Unlike the fixed-line sector, the relationship between economic development and network accessibility performance in mobile network has been less relevant. As shown in Figure 8, some developing economies, for example Chile and Malaysia, enjoy an equal if not higher penetration rate (subscribers/100 inhabitants) compared with their developed counterparts. It is worth noting that Chinese Taipei and Hong Kong have ranked 1 and 3 respectively in the global mobile penetration ranking since 2003.

Figure 8 Mobile penetration rate and GDP per capita

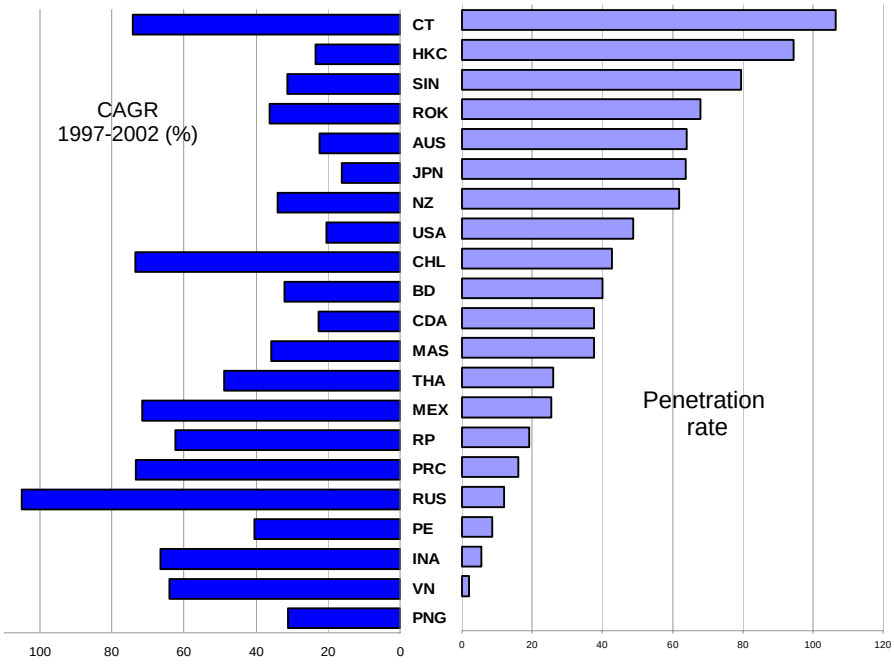


Source: ITU, 2003

High mobile growth in all APEC economics regardless of economic and network development

Unlike the fixed-line sector, the high growth rate in the mobile sector is occurring regardless of the level of economic and network development. Chinese Taipei, for example, maintained a 20 % compound annual growth rate between 1999 and 2002 despite the fact that the penetration rated had already reached 52 in 1999[5]. Mobile subscribers in Russia have also been doubled in 5-year time.

Figure 9 compound annual growth rate and Mobile penetration rate (2002)



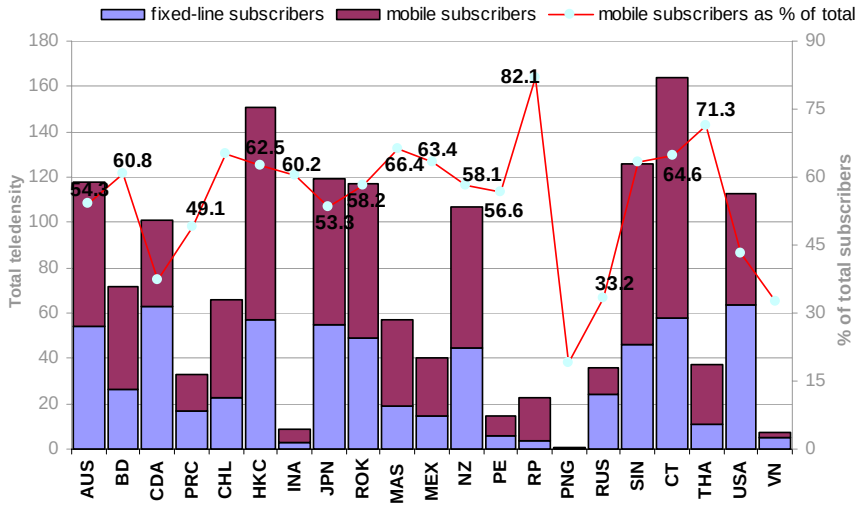
Source: ITU, 2003

[5] By comparison, the average penetration rate for Europe in 2002 is 51.26.

In majority of APEC economies the number of mobile subscribers has overtaken fixed line subscribers

Unsurprisingly, extensive network and subscription roll-outs in the mobile sector have led to the mobile network becoming the most popularly used e-infrastructure in the APEC region. As illustrated in figure 10, at the end of 2002 the number of mobile subscribers in the majority of APEC economies has over taken that of fixed-line subscribers to become the most commonly used infrastructure. The number of mobile subscribers in the majority APEC economies has already exceeded that of fixed-line PSTN.

Figure 10 Comparison of APEC fixed-line and mobile subscribers

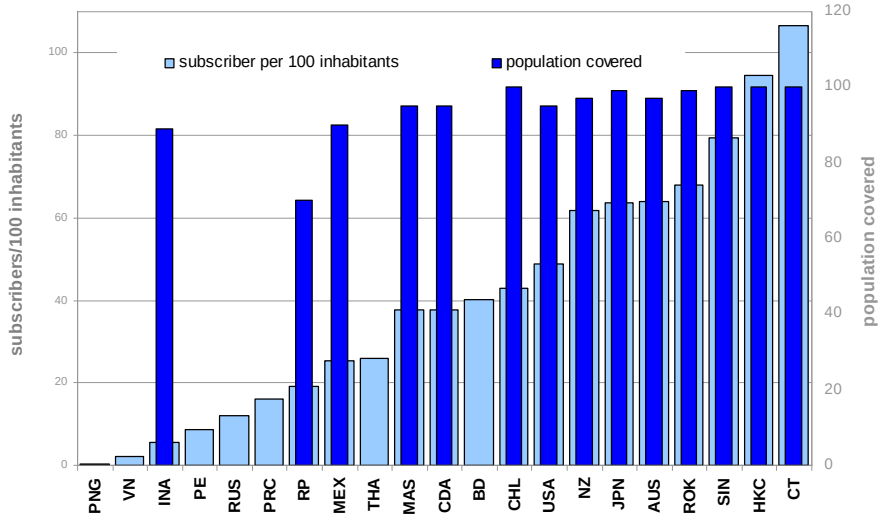


Source: ITU, 2003

Mobile network coverage reaching 100 pc of the population in many APEC economies

Mobile networks are also becoming the truly universal infrastructure in most APEC members--network coverage in most economies is reaching 100 % of the total population (Figure 11).

Figure 11 Mobile network coverage



Note: no data available for PNG, Viet Nam, Peru, Russia, China, Thailand and Brunei.

Source: ITU, 2003

(4) Development in cable (CATV) network

Cable is rapidly emerging as one of the major publicly available infrastructures.

Traditionally, cable network is optimised for delivering one-way analogue video programs using full coaxial cable networks. In the last decade cable networks through the APEC region have been upgraded to a combination of fibre-optical and coaxial cables (hybrid fibre coax cable, HFC). Now, technical advances enable more flexible utilization of bandwidth and support bi-directional service provisions., Broadband Internet access using cable modem currently has the capability of providing access speeds (bandwidth) between 30 to 40 Mbps[6], and cable telephony is also becoming an alternative to traditional fixed-line PSTN services in many economies. Substantial technical and economic hurdles must be overcome before cable can provide full-service networks. Yet with the advancement of IP-based network technologies (and costs), it is envisaged that the entry barriers for cable network to provide multimedia services will be significantly reduced.

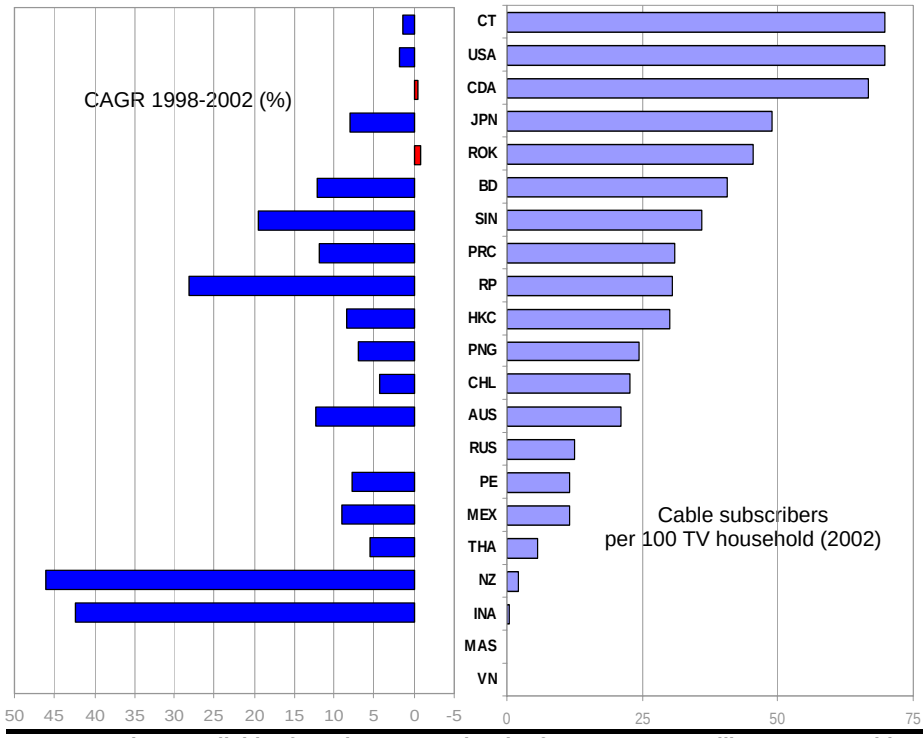
50 pc of households equipped with TV subscribe to cable services in some APEC economies

Despite relatively low penetration rates compared with fixed-line PSTN and mobile services, growth in cable penetration in some economies has been remarkable. In Canada, Japan, Chinese Taipei and U.S.A more than 50% of households equipped with TV are subscribed to cable services. Rapid market take-off also took place in Singapore, the Philippines, New Zealand and Indonesia during the last five years.

The trend is clear—cable network is rapidly emerging as one of the major publicly available infrastructures. In fact cable coverage has expanded to the degree that many economies from the high penetration group, i.e. USA, Canada, Singapore and Hong Kong, have already implemented open access obligations on incumbent cable operators for competitive Internet access providers. Australia and Korea are also planning to follow suit.

[6] It has to be point out that the bandwidth is shared by the number of subscribers within the same feeder area, thus the effective speed is usually around 1.5Mbps.

Figure 12 cable penetration and subscription compound annual growth rate



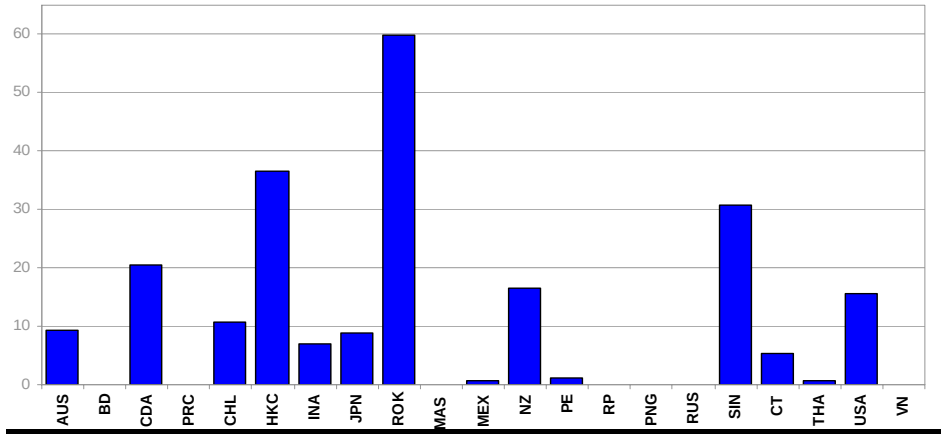
Note: No data available for Vietnam. Malaysia focuses on satellite system with a penetration rate of around 22% per 100 TV equipped household.

Source: ITU, 2003

Cable networks becoming popular means for broadband internet access.

Apart from provision of video-visual programs, cable networks are also becoming a popular alternative means of broadband Internet access infrastructure. More than 60% of cable subscribers in Korea use cable modem for Internet access. Cable modem subscribers in Hong Kong and Singapore are both exceeding 30%.

Figure 13 Cable modem subscribers as % of cable subscribers



Note: data not available for Brunei, China, Malaysia, PNG, The Philippines, Russia and Viet Nam.

Source: ITU, 2003

(5) Development in Internet accessibility

- **Narrow and broad band Internet access**

Technically speaking, Internet is an inter-networking system connecting more than 50,000 sub-networks worldwide. By virtue of this character Internet itself could be viewed as an infrastructure that provides true global connectivity. With the rapid expansion of Internet-based applications (e.g. Internet Protocol (IP) applications), the importance of Internet as one of the core elements of the e-infrastructure is increasingly evident.

Broadband demand robust to meet growing array of e-applications not possible at 56 Kbps

A growing number of Internet-based e-applications require a flexible bandwidth (Table 2) which cannot be effectively facilitated through the traditional dial-up access service that provides a maximum speed of 56 Kbps. Not surprisingly, demand for broadband Internet access has been extremely robust recently and it is fast becoming the main stream Internet access method; assessments and surveys on Internet accessibility will not be complete without the inclusion of broadband accessibility.

There are various definitions on the minimum speed of broadband. Commonly quoted are ITU's 128 Kbps, FCC's definition of 200 Kbps, OECD's 256 Kbps downstream. Due to the fact that the ITU database is used in this document and the fact that 128 Kbps will be able to support the minimum bandwidth requirement for many applications, broadband is thus defined in this document as any access speed above 128 Kbps.

Table 2 Bandwidth requirement for different Internet-based e-services

Applications	Minimum bandwidth (Kbps)	Desirable bandwidth (Kbps)	Broadband required to meet min. bandwidth
IP-Telephony	10	64	**X**
Telegames	40	600	**X**
Home Shopping	40	7000	**X**
Electronic Banking	40	400	**X**
Electronic Newspaper	40	2000	**X**
Tele-working	110	7000	✓
Video Conferencing	110	800	✓
Tele or E-Learning	110	7000	✓
Tele-medicine	110	7000	✓
Video Telephony	70	200	✓
Audio-on-Demand	110	700	✓
Movies-on-Demand	1000	7000	✓
Digital TV	1000	7000	✓

Note: 1000 Kbps = I Mbps

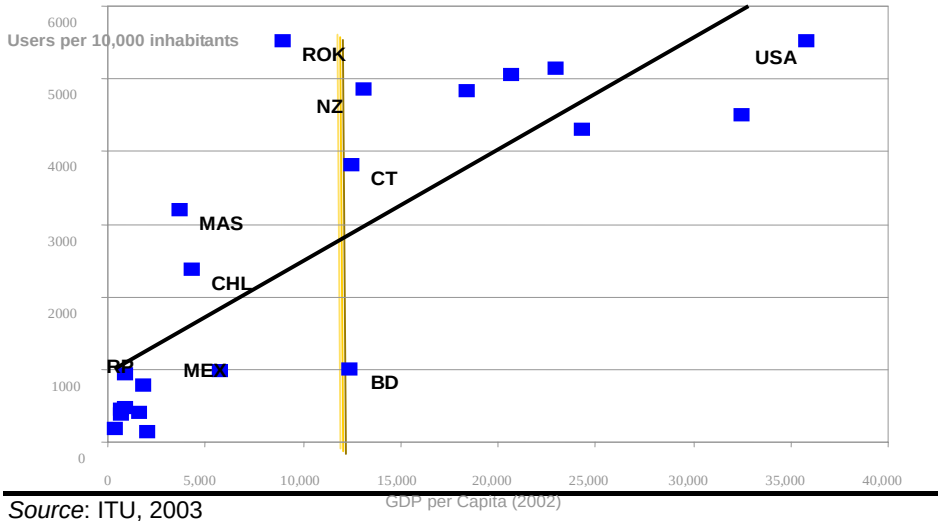
Source: Canadian National Broadband Task Force, 2001.

- **Status of Internet access**

Internet penetration linked to per capita income but other policies also crucial

Figure 14 shows the total Internet penetration of subscribers per 10,000 inhabitants at the end of 2002 across APEC economies. Economies with higher economic development tend to have a higher penetration rate. Korea, New Zealand, Malaysia and Chile performed well above the average of their GDP level. This outcome is linked with the accessibility of other e-infrastructures discussed previously. Policy, however, also plays an important role in promoting Internet accessibility. Thus economies with a similar level of economic development varied substantially in terms of Internet accessibility. For example, using USD$12,500 GDP per capita as the factor to decide peer economies sharing a similar level of development phase, figure 14 demonstrates that Korea and New Zealand have the highest penetration rate in this peer group (and even in the APEC region), with Chinese Taipei in the middle and Brunei with a relatively low penetration rate.

Figure 14 Internet penetration rate and GDP per capita (2002)



Source: ITU, 2003

In APEC internet users vastly outnumber internet subscribers

Another approach in exploring Internet accessibility is to compare the difference between Internet user and Internet subscriber penetration rate[7]. As demonstrate in figure 15, in most APEC economies Internet users significantly outnumbered subscribers. The case is especially obvious in Chile, New Zealand, Canada, USA and Korea. On the other hand, the gaps in Hong Kong, Chinese Taipei and especially Singapore are close to dismissible.

Several reasons might be account for the gap between the two indicators. One person might possess multiple accounts (one dial-up and one

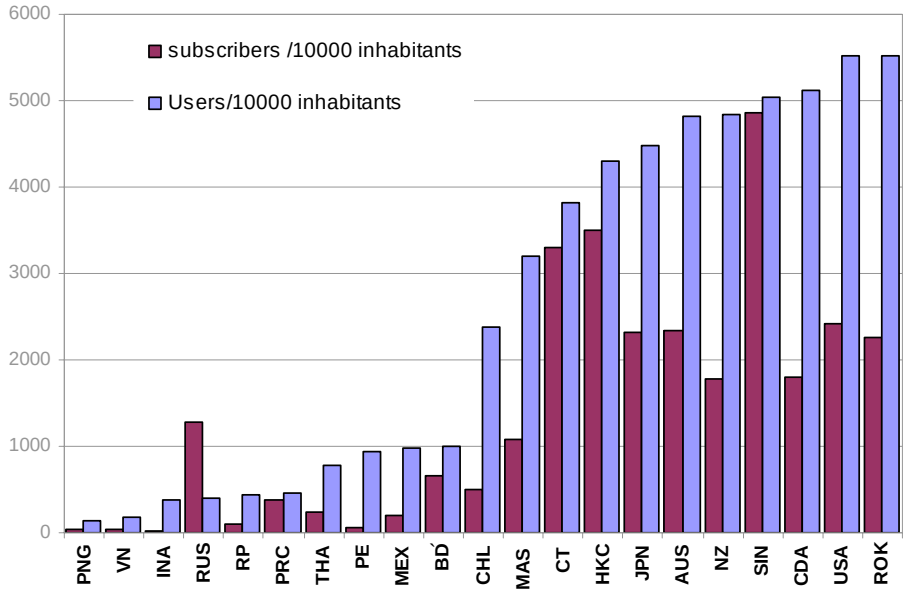
[7] "Internet users" indicates the number of people spending usually more than 20 hours per week using the Internet while "Internet subscribers" captures the number of people possessing a current Internet access account.

broadband for instance) or several peoples share a single account. This is especially true in markets where it is common for ISPs to offer free dial-up accounts in exchange for customer's information.

Public access points are increasing. EU has developed "public access indicator". No adequate data is available for APEC.

More importantly, there is increasing number of public Internet access points, e.g. in public schools, libraries and community centres, that are opened to the public without requiring individual access accounts. Recognising this development, the European Union (EU) has recently included a "public access indicator" as part of its e-Europe assessment exercise to capture the number of public Internet access points (PIAPs)[8]. Currently few comparable data are available for APEC economies to assess the accessibility of pubic and community based Internet access facilities.

Figure 15 Comparison of Internet users and subscribers penetration rate



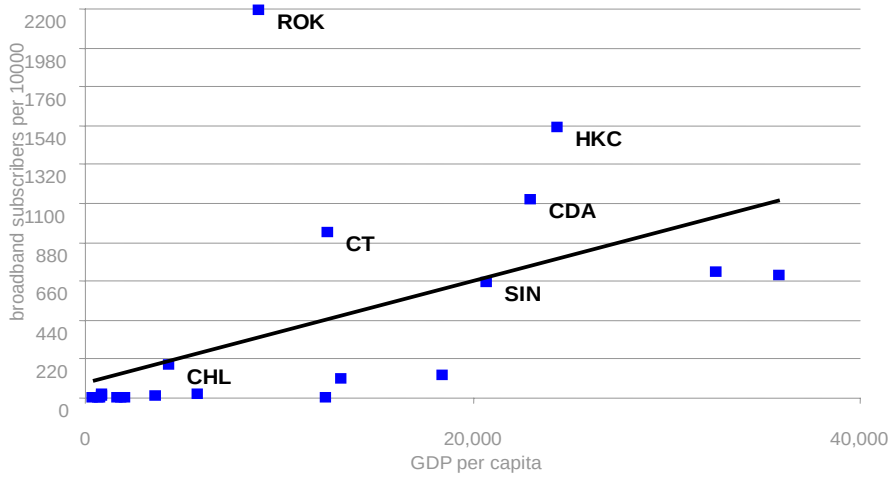
Source: ITU, 2003

- **Accessibility of broadband Internet access**

Broadband mainly in developed economies. Korea and Hong Kong, China led broadband penetration.

The majority of broadband subscribers are found in developed APEC economies. Yet there are, as demonstrated in Figure 16, larger disparities even among developed APEC members. The most advanced APEC economy in broadband development is undoubtedly Korea, which is also the world leader in broadband accessibility. At the end of 2002 broadband subscribers in Korea reached 2200 per 10,000 inhabitants. This is followed by Hong Kong with 1540 subscribers (Figure 16).

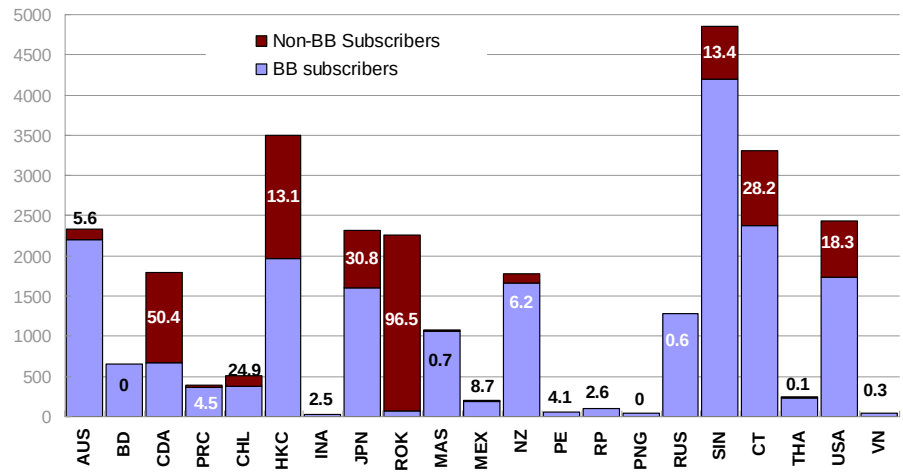
Figure 16 Broadband penetration rate and GDP per capita (2002)



Source: ITU, 2003

With respect to market take-up, broadband is the preferred access technology in Korea and Canada with 96.5% and 50.4 % of total Internet subscribers using broadband access at the end of 2002 (Figure 17). Other economies with mass conversion include Japan, Chile, Chinese Taipei, Hong Kong, Singapore and USA.

Figure17 Broadband subscribers as % of total Internet subscribers (2002)



Note: numbers in each economy denotes the percentage of broadband subscribers of total Internet subscribers.

Source: ITU, 2003

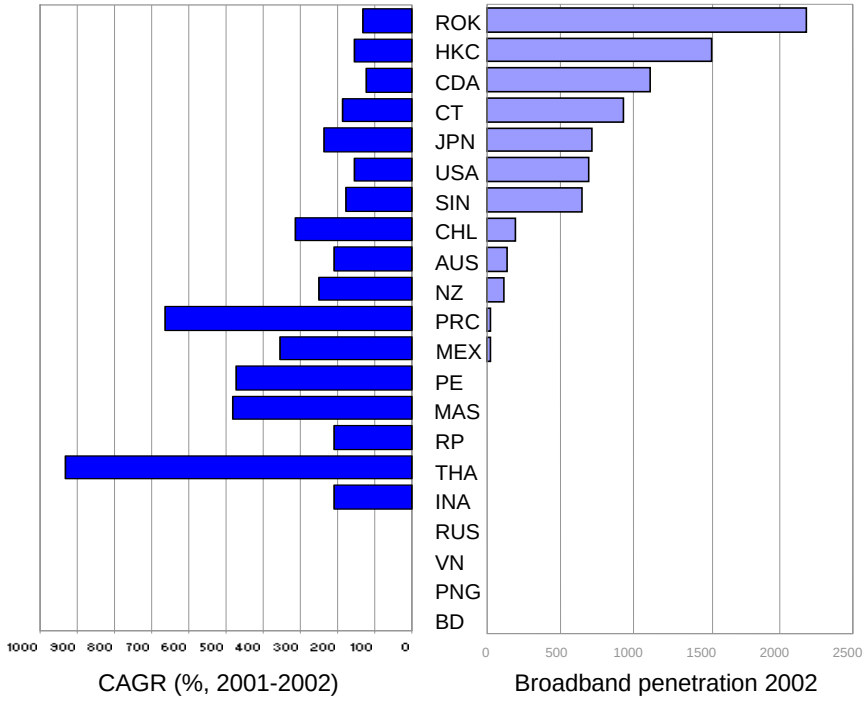
Rapid growth in broadband in many developing economies. Average is 200 pc growth.

Broadband development in developing APEC economies has been slow in the past but the gap is closing rapidly. Thailand for instance had an average

[8] PIAP is defined as publicly provided centres providing access to the Internet regardless of their public and/or private provider and whether access is free or not but excluding fully private Internet cafes.

growth rate of 900% during 2001-2002. A 650% growth rate was recorded in China with 200% growth rate for most developing APEC. It has to be noted that in some economies, including Russia, Vietnam, PNG and Brunei, at least from data available to this report, broadband accessibility has been under-developed.

Figure 18 Broadband penetration rate and compound annual growth rate



Source: ITU, 2003

1.3 Affordability of e-infrastructure

Affordability is fundamental.

Affordability is one of the most fundamental elements affecting e-readiness. Accessibility provides information about the availability of e-infrastructure but affordability indicates whether available infrastructure can be accessed at prevailing incomes.

The tariff structure for most e-infrastructure services can be divided into three distinct portions. First, is the connection charge, which is the cost for establishing a connection from customers' premises to the operators' network; this is normally a once-off charge. Second, is the line rental charge, which is in principle the cost for maintaining continuing access to the operators' network. Third, is the per call charges, which is the cost for supplying a particular service and is usually calculated by the duration of the service provided. Table 3 summarizes these charges. Connection and line rental charges are generally levied irrespective of usage. Therefore these charges

comprise a larger proportion of the total cost for receiving service for low-volume users than higher-volume users.

Determining affordability is not easy.

The calculation and determination of fixed-line local call tariffs involve a variety of considerations. First the cost for infrastructure development and business operation differ substantially across economies. In some economies it is also a politically and socially sensitive process. In an effort to present a meaningful comparison, affordability is measured by the tariffs of related services as a percentage of each economy's per capita income.

Due to availability of data on per usage charges only connection and line rental charges for business and residential users are assessed at this stage. Data is complied from ITU data base and converted into US dollars based on 2002 annual average exchange rate.

Table 3 Tariff structure of e-infrastructure related services

Charge type	Service	Feature
Connection charge	Connection with infrastructure	Independent of usage
Line rental charge	Ongoing access to infrastructure	Independent of usage
Per-usage charge	Actual usage of infrastructure	Per usage

(1) Affordability in fixed-line service

- **Affordability of residential and business connection charges**

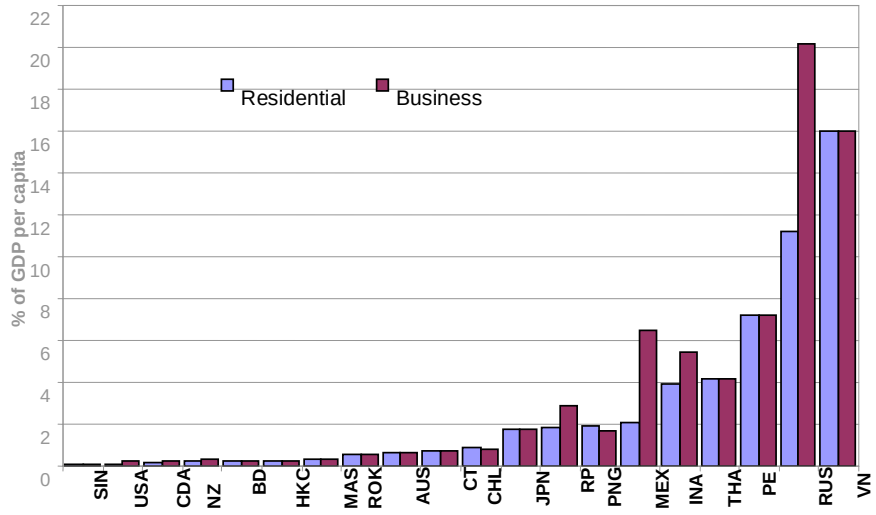
In most of APEC fixed line connection charges take less than 1% of average annual income.

At the end of 2002 fixed-line connection charges in the vast majority of APEC economies took less than 1 % of the average annual income. Singapore has the most affordable for both residential and business users. Japan is the only developed economy with an affordability reaching 2% GPD per capita. Connection charges for residential users are most unaffordable in Vietnam where connection charges were equivalent to 16% of average annual income.

In most cases business and residential users are similar in APEC.

For the majority of APEC economies business affordability is similar to that of residential users. For business users affordability in Russia is the lowest. In Mexico and Russia are connection charges for business users high than for residential users. A considerable difference in affordability between residential and business exists in Russia.

Figure 19 Affordability of fixed-line connection charge (2002)



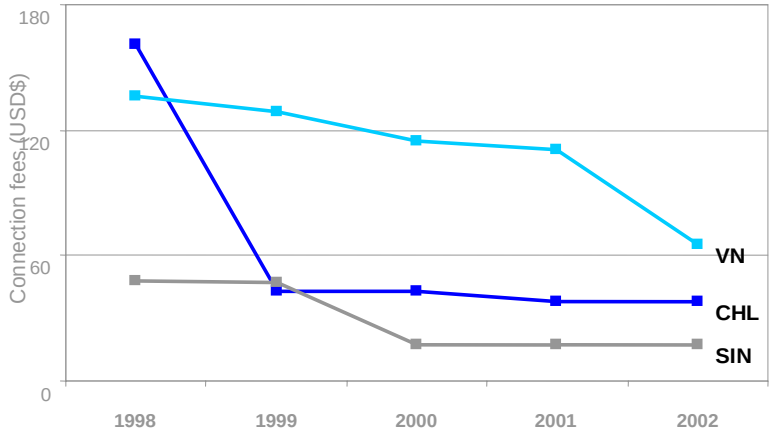
Note: No data available for China

Source: ITU, 2003

Connection charges have been declining in some APEC economies over recent years

Connection charges for both residential and business users have been declining sharply in some APEC economies during the last five years. Different strategies have been adopted. For example Chilean operators chose to reduce connection charge by more than 70 % in one year (Figure 20) while a more steady reduction is opted by Vietnam.

Figure 20 Changes in connection charge in selected APEC economies



Source: ITU, 2003

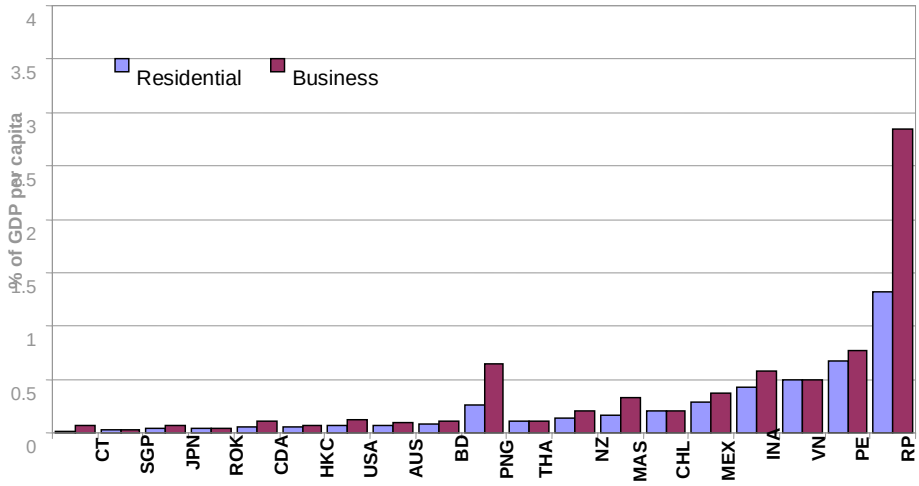
- **Affordability of residential and business line rental charges**

Rental charges are largely consistent with connection charges.

Affordability for line rental charges is in principle consistent with connection charges. Chinese Taipei has the most affordable rental charges for residential users while Singapore continues to lead for business users. Both Japan and

Vietnam have comparable line rental and connection affordability. On the other hand the Philippines is the most expensive economy in line rental charges for both residential as well as business users and the most discriminatory environment for business users in terms of line rental charges in the APEC region.

Figure 21 Affordability of fixed-line line rental charge (2002)



Note: No data available for China and Russia

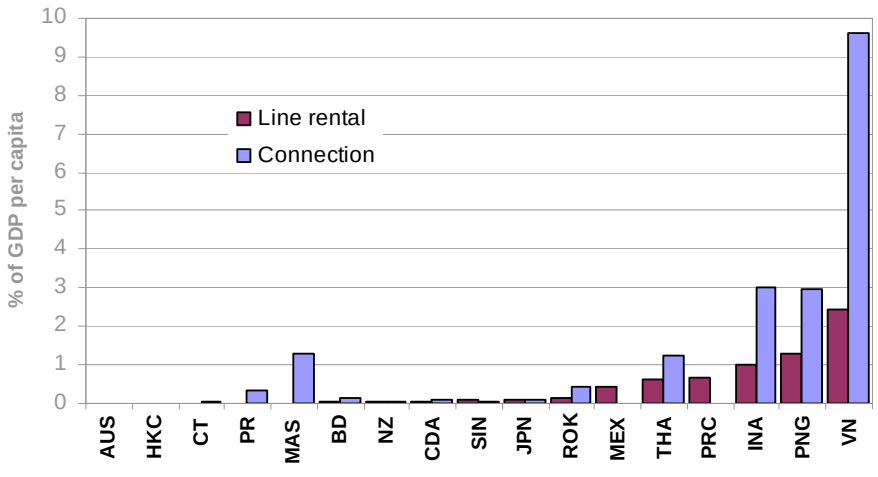
Source: ITU, 2003

(2) Affordability in mobile service

Most economies have low mobile connection and line rental charges on a GDP per capita basis

At the end of 2002 operators in two economies, namely Australia and Hong Kong, imposed no charge for mobile connection and line rentals. Operators in Chinese Taipei charged only connection fees but not line rental. Mobile services were the least affordable in Indonesia, PNG and Vietnam.

Figure 22 Affordability of mobile connection and line rentals (2002)



Note: No data available for Chile, Peru, Russia and USA.

Source: ITU, 2003

(3) Affordability in Internet service

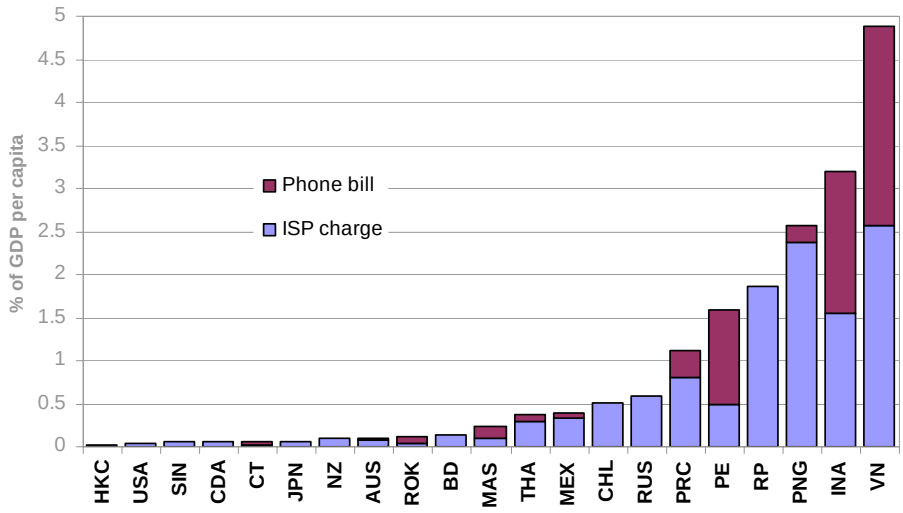
Internet affordability must be analysed differently

Due to the unique feature of Internet services, a different approach to analysing Internet affordability is needed. Considering that fact that dial-up is still the most dominating Internet access method, in this section assessment if made of affordability for dial-up Internet services only, based on a 20-hour per month usage. The tariff structure of Internet services is accordingly split into the costs of obtaining the ISP service and the costs of telephone usage.

Internet generally affordable but in some cases a large proportion goes to phone services

Figure 23 below illustrates Internet service affordability in the APEC region in 2002. For most economies the level of affordability for Internet services is high. Vietnam and Indonesia have still the least affordable Internet service. Note that a considerable portion of the costs in Peru, Indonesia and Vietnam goes to the usage of phone services rather than the ISP service itself.

Figure 23 Affordability of Internet access charge (2002)



Source: ITU, 2003

1.4 International comparison

Big differences between developed and developing in APEC but the latter is improving

The preceding section presents in broad terms the status and general trend in e-infrastructure development across APEC member economies. While substantial differences in both accessibility and affordability remained, in particular, between developed and developing economies, conditions in the latter group of economies have improved significantly. Some economies, such as Korea, Chinese Taipei, New Zealand, Chile and Malaysia, performed well in relation to their respective economic development.

This finding is consistent with the latest ITU (2003a) study aimed at measuring the access conditions for the Information Society. The main task of the study is to establish a Digital Access Index (DAI) which uses a much wider set of indicators (Table 4) to capture the ability of individual economy to

APEC can be compared with the rest of the world using ITU methodology

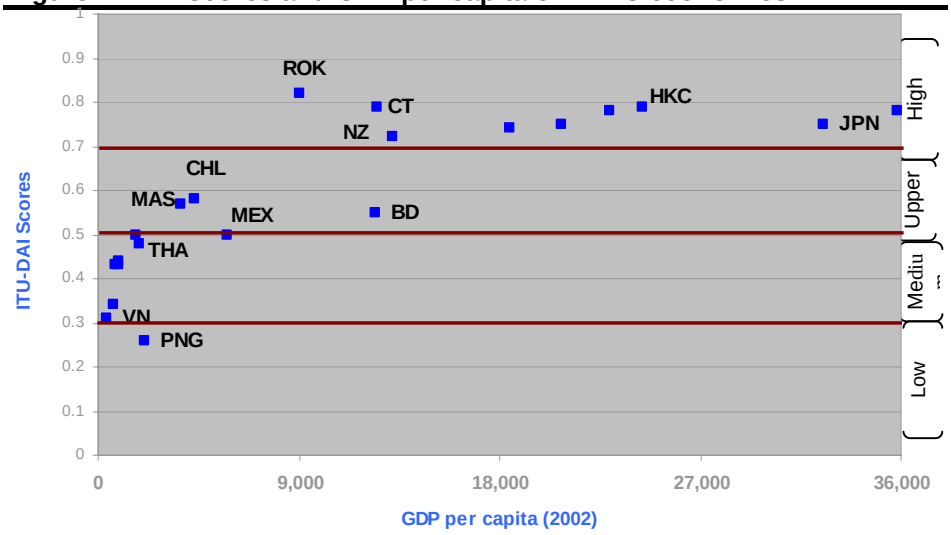
access and use ICT. The result of each indicator is then converted into a value between zero and one, which is decided by a pre-determined "goal post", so the results can be compared across economies. The results of the DAI index are then split into four groups of economies: high (0.7 and above), upper (0.5 and above), medium (0.3 and above) and low (below 0.3). Figure 24 provides the scores of APEC member economic under the DAI index.

Table 4 Synopsis of ITU-DAI indicators

Category	Variables	Indicators	Goalposts
Infrastructure	Fixed telephone subscribers Mobile subscribers	Fixed telephone subscribers per 100 inhabitants Mobile subscribers per 100 inhabitants	60 100
Affordability	20 hr per month Internet access	Internet charge as % of GNI per capita	1
Knowledge	Literacy School enrolment	Adult literacy rate Combined primary , secondary and tertiary school enrolment rate	100 100
Quality	Int'l Internet bandwidth (Mbps) Broadband subscribers	Int'l Internet bandwidth per capita Broadband subscribers per 100 inhabitants	10,000 35
usage	Internet users	Internet users per 100 inhabitants	85

Source: ITU, 2003a

Figure 24 DAI scores and GDP per capita of APEC economies



Source: ITU, 2003

ITU uses goalposts for longer-term policy targets for the Information Society

The DAI index provides a useful reference to examine APEC economies' performance in the international context. Of relevance is the inclusion of the "goalposts" for each indicator that are considered by ITU as longer-term policy goals for the realization of the Information Society. The goalposts are decided by benchmarking the best-performed economies in each category worldwide[9].

[9] For example, goalpost for fixed-line subscribers is chosen based on the performance of Sweden, mobile subscribers based on Chinese Taipei, Internet users based on Iceland (forecast) and broadband subscribers based on Korea (forecast).

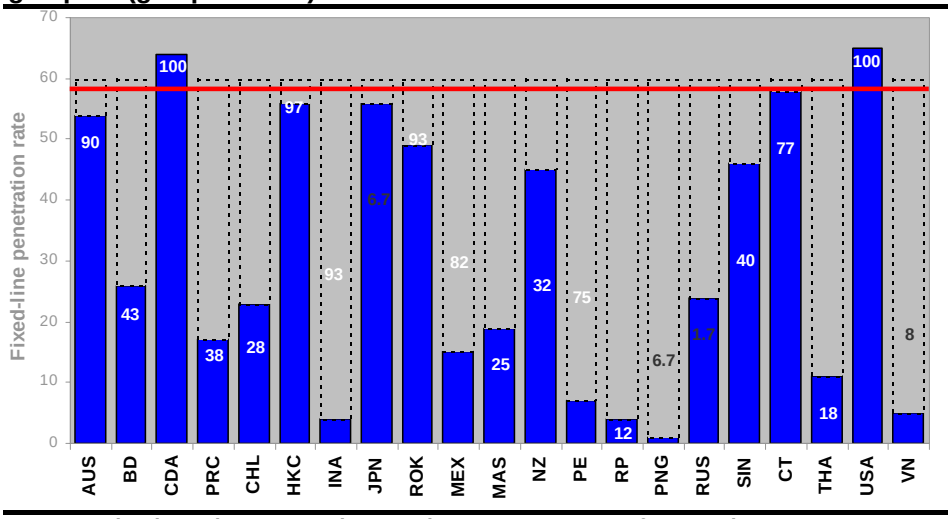
Using the goalposts as benchmarks, the performance of those segments discussed in the preceding section among APEC economies can be reviewed in relation to international best practice.

(1) Fixed-line penetration performance

Not all APEC economies are moving forward on fixed line penetration.

For fixed-line performance, at the end of 2002 Canada and USA have both achieved the goalpost of 60 subscribers per 100 inhabitants, and Chinese Taipei, Hong Kong, Japan as well as Australia are in very close proximity (Figure 25). Indonesia, the Philippines and PNG are falling behind with respect to fixed-line penetration rate.

Figure 25 APEC economies' fixed-line development (2002) as % of DAI goalpost (goalpost = 60)



Note: Number in each economy denotes the status quo as % of DAI goalpost.

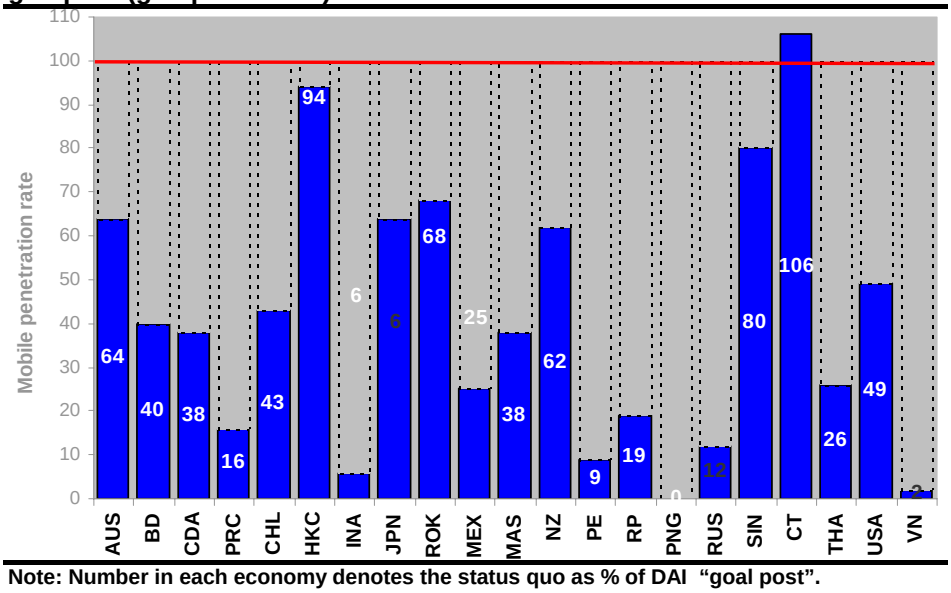
Source: ITU, 2003

(2) Mobile penetration performance

Most APEC economies have not yet reached the goalposts on mobile penetration

For mobile penetration performance, Chinese Taipei is the only APEC economy reaching the goalpost of 100 per 100 inhabitants at the end of 2002. Hong Kong follows with a 94% achievement rate, and the figure for Singapore is 80% (Figure 26). On the other hand Indonesia, Vietnam and especially PNG have so far been lagging behind the goalpost.

Figure 26 APEC economies' mobile development (2002) as % of DAI goalpost (goalpost = 100)



Note: Number in each economy denotes the status quo as % of DAI "goal post".

Source: ITU, 2003

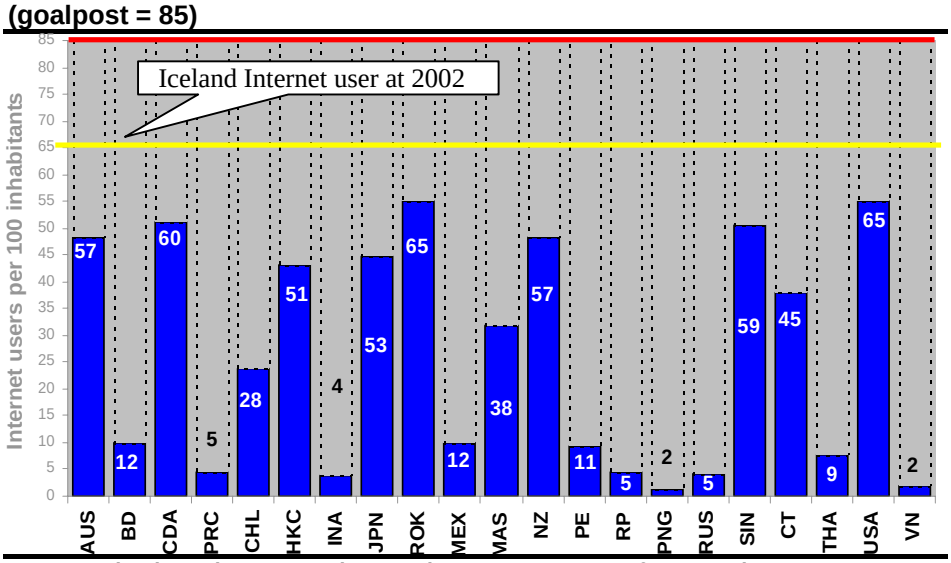
(3) Internet user performance

Goalpost is demanding for internet performance but more policy focus required in APEC generally

The Internet user rate is evidently the category where more policy focus is needed across APEC region when comparing with a demanding goalpost of 85 per 100 inhabitants. Both Korea and USA have the highest number of Internet users but is still well below the goalpost. Many economies, including China, Indonesia, the Philippines, PNG, Russia, Thailand and Vietnam, achieved at the end of 2002 less than 10 % of the goalpost.

It has to be noted that the goalpost is in fact a forecast based on Iceland's Internet user growth rate. The goalpost used here is the projection of Internet users in Iceland by the year 2008. If taking the actual user rate in Iceland at 2002, which is 65 per 100 inhabitants, as the benchmark, APEC economies will have a much better performance albeit still falling below that benchmark.

Figure 27 APEC economies' Internet users (2002) as % of DAI goalpost (goalpost = 85)



Note: Number in each economy denotes the status quo as % of DAI "goal post".

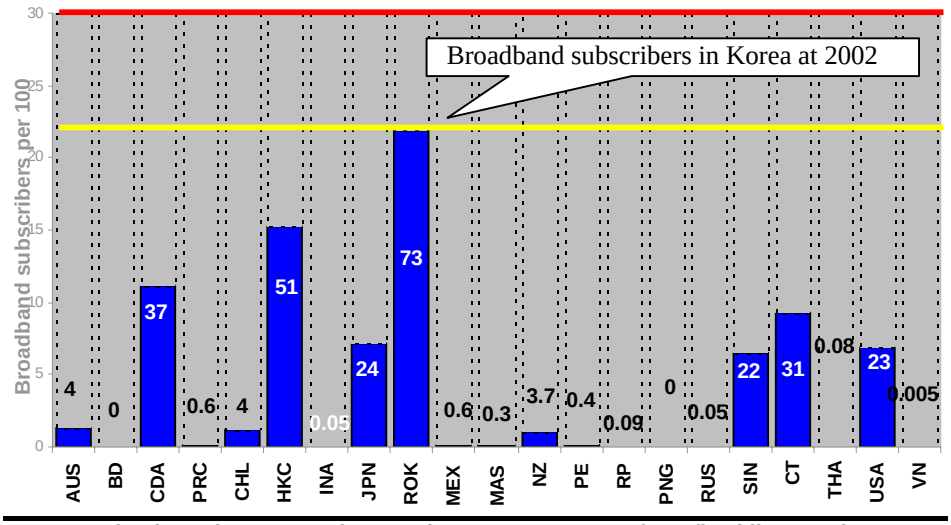
Source: ITU, 2003

(4) Broadband subscription performance

Goalpost is also tough on broadband. Korea is setting the pace internationally.

The broadband subscriber rate is another area where policy priority is needed. Many economies have not achieved 1 % of the target set by the demanding goalpost. Yet again it has to be point out that the goalpost adopted is based on the forecast Korea's development in broadband Internet. The goalpost used is the projection of broadband subscribers in Korea by 2007.

Figure 27 APEC economies' broadband subscribers (2002) as % of DAI goalpost (goalpost = 30)



Note: Number in each economy denotes the status quo as % of DAI fixed-line "goal post".

Source: ITU, 2003