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Broadband Network Development for Green Growth

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TEL 11/2013 – Study Report on Broadband Network Development for Green Growth

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1. Executive summary

1.1 Background

To accelerate the development of high-bandwidth information infrastructure has become strategic objectives in the development agenda of various member economies. The broadband network not only drives the informatization process of the entire society, but also becomes a strategic infrastructure which has significant influences on the green and sustainable development and the enhancement of the economic competitiveness.

At the 18th APEC Economic Leader's Meeting held in 2010, the leaders of APEC declared to "accelerate our innovative growth by promoting broadband infrastructure development, enhancing information and communication technologies (ICTs) utilization, and adopting policies and regulations to foster innovation and use of ICTs". At the 8th APEC Telecommunications and Information Ministerial Meeting, the ministers also declared: "comprehensive efforts made by APEC economies to further develop their ICT infrastructure and to achieve the goal of universal access to broadband in the APEC region by 2015".

The workshop on broadband network development for green growth was proposed in TEL46 by China and approved by DSG and TEL. The sponsoring economies included China; Hong Kong, China; Japan; Malaysia; Chinese Taipei and Thailand.

Through this workshop, policy makers, regulators, private sector stakeholders and academia both from developed economies and developing economies had an opportunity to share their experiences on broadband network development for green growth.

This study report is one part of the project of Workshop on broadband network development for green growth.

1.2 Objectives

The main objectives of this study report are as follows:

- To analyze the status of broadband network development and the important role it plays in promoting green growth in APEC economies, main problems and challenges the economies are facing in promoting broadband network development for green growth.

- To provide references for developing economies, to promote technology and policy

capacity building in developing economies in a view to bridge the digital divide and achieve balanced development in the region.

1.3 Methods

- Gather and process information and perform analysis about broadband network development for green growth in the APEC region;

- By the study on the information and studies on broadband network development for green growth, develop a speech material for the workshop;

- In coordination with Project Overseer, participate in the workshop to report on the report undertaken and the key findings;

- As reference of the materials provided from the speeches and discussion in the workshop, formulate the final version study report;

- Submit a study report to TEL, provide an electronic copy to the APEC Secretariat, and identify other channels for dissemination of report.

1.4 Glossary

Green Growth：Fostering economic growth and social development, while ensuring the natural assets continue to provide the resources and environmental services for us.

Consumer Surplus：The amount that consumers benefit from purchasing a product for a price that is less than what they would be willing to pay.

Social Cohesion：The sociology, political science and social policy that describes the bonds or glue that bring people together in society, especially in the context of cultural diversity. Its constituent elements include concerns about social inclusion, social capital and social mobility.

Digital Literacy: Digital literacy is the ability to effectively and critically navigate, evaluate and create information using a range of digital technologies. It requires one to recognize and use that power, to manipulate and transform digital media, to distribute pervasively, and to easily adapt them to new forms. Digital information is a symbolic representation of data, and literacy refers to the ability to read for knowledge, write coherently, and think critically about the written word.

Private Public Partnership: A public–private partnership (PPP) is a government service or private business venture which is funded and operated through a partnership

of government and one or more private sector companies. It involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project.

Broadband Universal Service: Broadband universal service, also known as "universal broadband service", refers to government efforts to ensure all citizens have access to Internet service. Whether traditional universal voice service plans should be expanded to include broadband service has been in discussion for several years in various economies.

1.5 Executive summary

- Broadband plays an important role in promoting green growth. Broadband has a significant positive effect on economic growth, including GDP growth, job creation, consumer surplus, firm efficiency and so on. Broadband development can minimize the digital divide and improve social cohesion. Broadband also can improve energy efficiency.
- It is necessary for the government to support broadband development, especially in developing economies.
- Many economies develop some policies to support broadband development such as financial support policies, broadband universal service policy.
- Improving access to broadband networks requires addressing both supply-side and demand-side bottlenecks.
- The ways of promoting demand for broadband vary among the economies with different level of technically literate.
- Government should encourage enterprises invest more on broadband development. For telecom enterprises, there are numerous measures and opportunities to enhance the sustainability of green growth in their own organization and business.

2. Broadband and Green Growth

In Chapter 2, We will analyse the important role of broadband in promoting green growth from three aspects: economic growth, social development, and environmental protection.

2.1 Economic growth

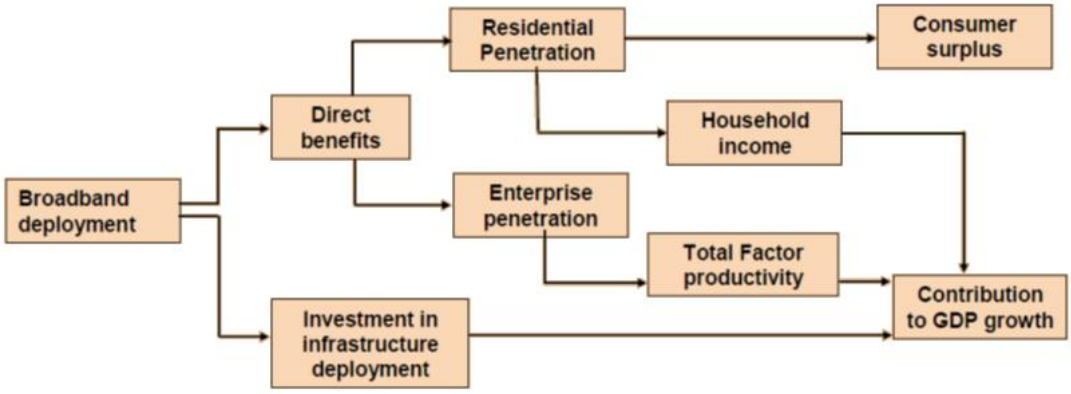
Influenced by the broadband network development, there are totally 4 types of effect for the economic growth:

- The first is direct drive from the development of broadband networks.
- The second effect results from the “spill-over” externalities, which influence both

enterprise and consumers. The adoption of broadband within firms leads to a multifactor productivity gain, which in turn contributes to growth of GDP. On the other hand, residential adoption drives an increase in household real income as a function of a multiplier.

- Third effect is consumer surplus, defined as the difference between what they would be willing to pay for broadband service and its price.
- The last one, while not being captured in the GDP statistics, is the improvement of firm efficiencies.

Fig. 1 The economic impact of broadband



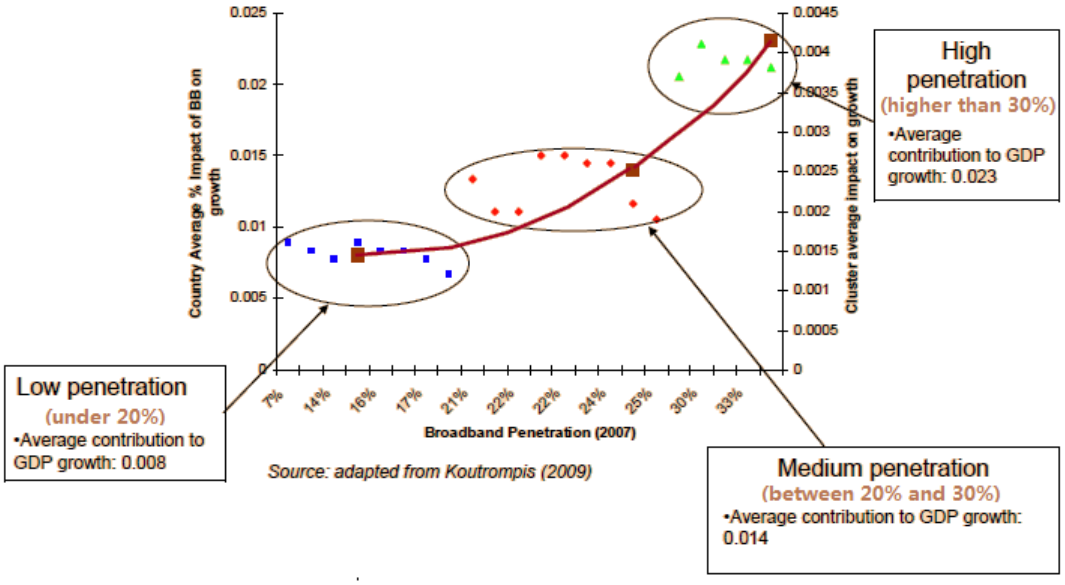
source：ITU

2.1.1 Contribution to economic growth

Broadband has a significant positive effect on GDP growth. According to analysis of OECD:

- Low broadband penetration (under 20%): an increase of 1 per cent in broadband adoption contributes to 0.008 per cent of GDP growth.
- Medium penetration (between 20% and 30%): the effect is of 0.014 per cent
- High penetration (higher than 30 %): the effect is of 0.023 per cent.

Fig. 2 Broadband penetration and contribution to GDP growth



source：ITU

At low levels of broadband penetration, the impact of broadband on the economy is minimal due to the "critical mass" concept. According to the "return to scale" theory, the impact of telecommunications infrastructure on the economic output is maximized once the infrastructure reaches a critical mass point, generally associated with levels of penetration of developed economies.

This rule also applies to the APEC region. For example, in Australia, an increase of 1 per cent in broadband adoption contributes to 0.044per cent of GDP growth, whose penetration is 25%. In Chile and Malaysia (the penetration of Chile is 12.25%, the penetration of Malaysia is 7.02%), whose penetration is much lower than Australia, contributes to GDP growth were also much lower than Australia (in Chile the effect is of 0.009 per cent, in Malaysia the effect is of 0.007 per cent).

2.1.2 Impact on job creation

Broadband network development affects employment in three ways.

- In the first place, network development requires the creation of direct jobs (such as telecommunications technicians, construction workers, and manufacturers of the required telecommunications equipment) to build the facility.
- In addition, the creation of direct jobs has an impact on indirect employment (such as upstream buying and selling between metal and electrical equipment manufacturing sectors).
- Finally, the household spending based on the income generated from the direct and indirect jobs creates induced employment.

We also found that the impact on employment differ according to industry sector. The

job creation impact of broadband tends to be concentrated in service industries, (e.g., financial services, education, health care, etc.). In some industry sectors, such as accommodations and food services industry, a negative relationship can be found with the deployment of broadband. This may be result from a particularly strong capital/labour substitution process taking place, whereby productivity gains from broadband adoption yields reduced employment.

Table 1 Impact on job creation in Some APEC Economies

Economy	Impact on job creation
USA	A USD 10 billion investment in broadband deployment can create 180,000 jobs-year (including 64,000 direct and 116,000 indirect and induced)
Chile	Broadband deployment, which reached a penetration of 9.8%, contributed 1.76% to the employment rate, which amounts to the creation of 114,426 direct and indirect jobs.
Indonesia	Each 1% increase in the penetration rate of the service among the Indonesian households, the unemployment growth would be reduced it by 8.6% points.

source：ITU

2.1.3 Creation of consumer surplus

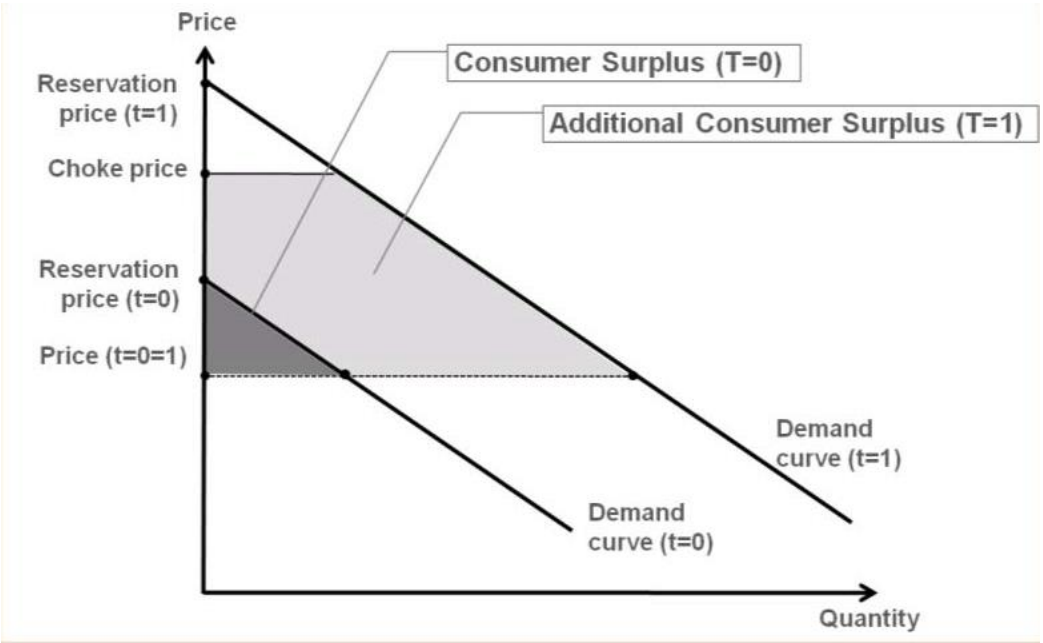
Consumer surplus is defined as the amount that consumers benefit from purchasing a product for a price that is less than what they would be willing to pay. Consumer surplus has been found to be affected by the positive externalities of broadband, also it is not necessarily captured by economic growth or employment creation .

Consumer surplus may be changed because of two reasons:

- An outward shift of the demand curve: the broader penetration of high speed broadband can cause the shift of the demand curve
- A price reduction: More competition and market saturation in broadband force producers to reduce prices.

Fig. 3 shows the outward shift of the demand curve. As indicated in this picture, the dark grey area represents the initial consumer surplus at t = (equal) 0. The shift of the demand curve at t =(equal) 1 results in an additional consumer surplus (light grey area). whole consumer surplus in period 1 is the sum of the dark and light grey areas.

Fig. 3 Consumer surplus



source：ITU

Table 2 Creation of consumer surplus in Some APEC Economies

Economy	Creation of consumer surplus
USA	In 2006 the consumer surplus generated by broadband represented USD 7.5 billion (or 27 per cent of the total USD 28 billion in broadband surplus)
Mexico	the total surplus is USD 2.30 billion, and the consumer portion was 8 per cent

source：ITU

2.1.4 Impact on firm efficiency

Firm efficiency is the microeconomic impact of broadband. The impact on firm efficiency of broadband focused on business expansion, product innovation and new business creation.

- **Business expansion:** In manufacturing sector, internet access enabled by broadband generate 6 per cent more foreign sales than the rest. In service sector , broadband enabled firms generate between 7.5 per cent and 10 per cent more sales
- **Product innovation:** Product innovation by broadband includes acceleration of innovation and increases productivity. The introduction of new applications and services causes acceleration of innovation. The adoption of more efficient business processes enabled by broadband increases productivity.
- **New business creation:** When a large enough number of households are connected to broadband, the incentive to develop new businesses around information search,

advertising and electronic commerce increases.

2.2 Social development

The influence to social development by broadband development can be summarized as two aspects: to minimize the digital divide and to improve social cohesion.

2.2.1 Minimizing the digital divide

During the broadband network development, there are always accompanied with some specific situations, including difficult geographical characteristics, low level of income, and power supply challenges. These main challenges for commercial investment above may cause digital divide.

- **Difficult geographical characteristics:** Broadband network development can be restricted by challenging geographical characteristics, such as mountainous terrain or sparse population. These factors greatly increase the cost and financial risk of developing broadband services – especially fibre solutions – in an area, and so discourage commercial investment.

- **Low level of income:** A low level of disposable income within an area is likely to reduce the demand for more expensive services, and in emerging markets may even inhibit the take-up of basic telecommunication services. Low demand reduces the potential for operators to generate a return on investment from deploying broadband infrastructure to such areas.

- **Power supply challenges:** Providing a reliable electricity source is important, not only to maintain access to services but also to prevent damage to equipment.A lack of reliable electricity supply to support broadband access is a problem for rural locations in many emerging markets.

2.2.2 Improving social cohesion

Some projects aim to achieve a range of benefits from the social impact of broadband, which is provision of e-health services, improved contact with community and family, remote working , education and lifelong learning, redistribution of wealth, all of these can improve social cohesion.

- **Provision of e-health services:** The ability to access information on healthcare is often listed as a major reason for obtaining access to the Internet. The availability of better health-related information has led to an improvement in healthcare in both the USA and Canada.

- **Improved contact with community and family:** Internet promotes contact with friends and family, and also allows users to maintain contact with people who share similar interests, which can help to promote social cohesion among members of the cooperative.

- **Remote working:** Access to information and communication technology (ICT) enables flexible working practices, in terms of both time and location. This benefits both employers and employees.

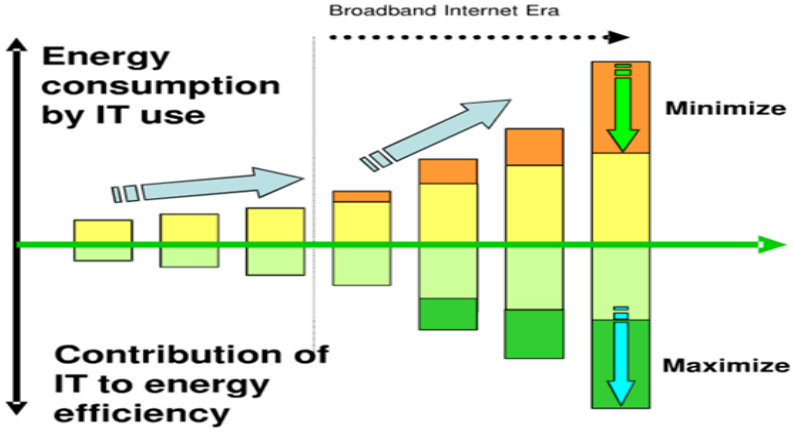
- **Education and lifelong learning:** Broadband can support teachers by increasing their efficiency in and outside the classroom; help teachers respond better to students' individual needs; and facilitate communication between teachers, students, parents and administrators. It also can give each student continuous access to online educational content and resources in and outside of school. Especially for students in rural areas, online education can reduce educational inequity brought about differences in geographical or economic conditions to improve the level of education of society as a whole.

- **Redistribution of wealth:** The provision of broadband services in underserved or unserved areas at similar prices (or even at lower prices) than in more privileged areas helps wealth to be redistributed. Providing local broadband also enables people to spend more time locally, rather than having to travel elsewhere, and encourages entrepreneurs to remain living locally rather than moving elsewhere.

2.3 Environmental Protection

Broadband can benefit energy efficiency in other industries. At the same time, broadband also minimize the energy consumption in energy industry itself. The most important thing is how to make the coordinated development of both.

Fig. 4 Broadband and energy efficiency

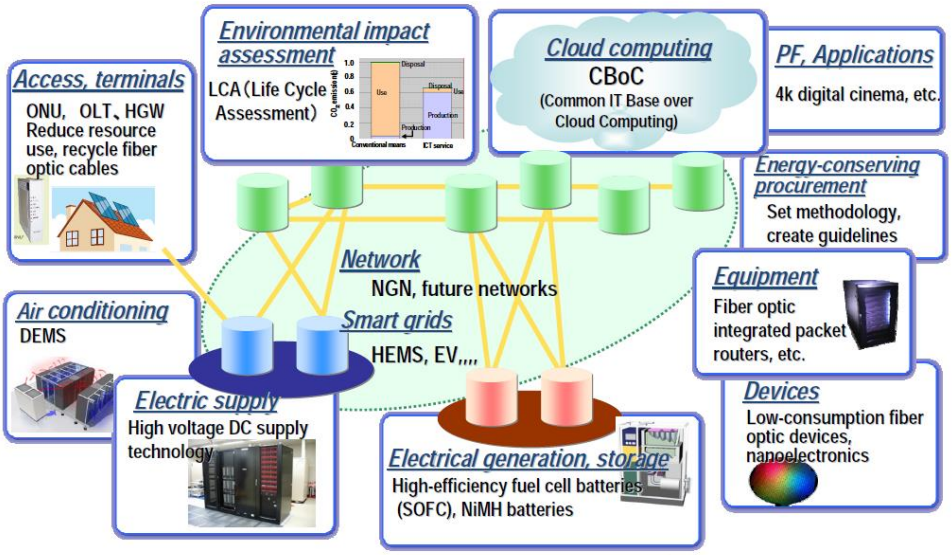


Source: Japan Green IT Initiative

2.3.1 Green of broadband

Broadband equipment product innovation, procurement, deployment, operation, maintenance etc., all of these can promote the green growth. Fig. 5 is an example of greet broadband network as a whole about NTT.

Fig. 5 NTT greet broadband network



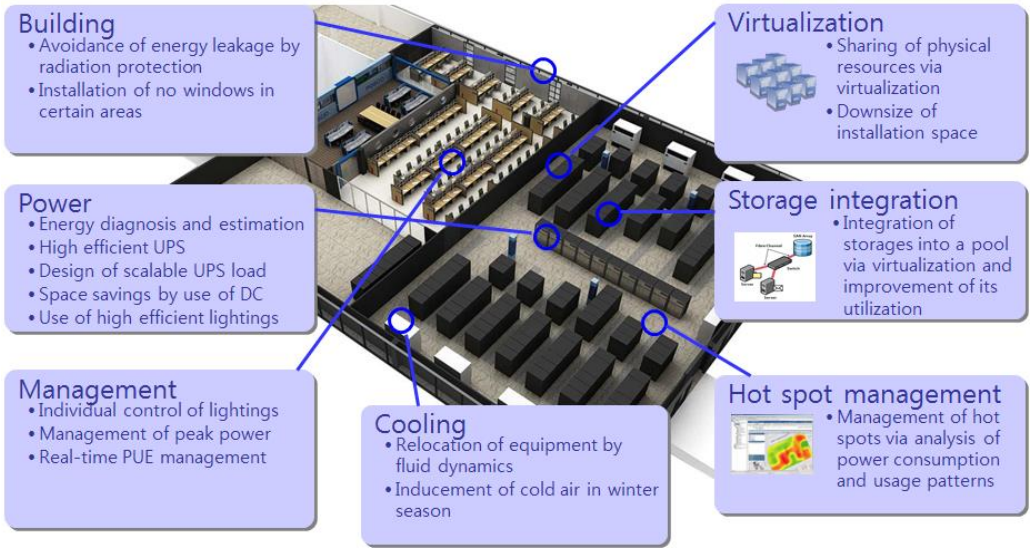
Source: Japan Green IT Initiative

It estimated that the electricity consumption of IT equipment in 2025 will be five times what it was in 2006, and that it will be 12 times greater in 2050. The main measures of NTT in green of broadband is：

- Lower power consumption of ICT equipment (e.g. server, router, terminal device)
- Creation of applicable clean energy in the ICT sector
- Waste recycling in ICT sector

Data centres also bring large energy consumption. Energy-saving technologies and solutions in the data centres can save a lot of energy.

Fig. 6 Green data centers



Source: Japan Green IT Initiative

Table 3 Energy savings effect of data centers

Best practices	Savings	Description
Virtualize servers	10 - 40%	Consolidation of applications onto fewer servers, typically blade servers
Right-size NCPI	10 - 30%	Using a modular, scalable power and cooling Architecture
More efficient air conditioner architecture	7 - 15%	Row-oriented cooling and shorter air paths
Economizer modes of air conditioners	4 - 15%	Choosing economizer options-offered air conditioners
More efficient floor layout	5 - 12%	hot-aisle / cold-aisle arrangement with suitable air conditioner locations
More efficient power equipment	4 - 10%	Best-in-class UPS, & light load efficiency rather than full load efficiency
Coordinate air conditioners	0 – 10%	One air conditioner may actually heat while another cools; and One may dehumidify while another humidifies.

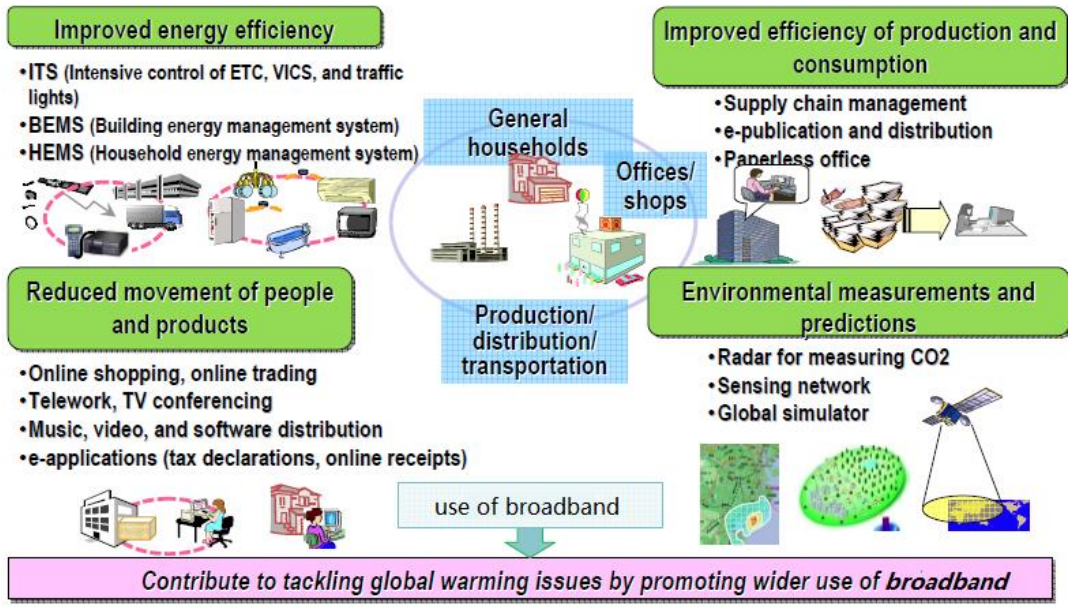
Source: Japan Green IT Initiative

2.3.2 Green by broadband

The widely use of broadband can significant promote the green growth, such as improving energy efficiency, reducing movement of people and products, improving efficiency of production and consumption, environmental measurements and

predictions.

Fig. 7 Green by broadband



Source: Japan Green IT Initiative

In this report, We list eight effects of reducing energy consumption based on using broadband, including consumption of goods, electric power or energy consumption, movement of people, movement of goods, office space efficiency, storage of goods, business efficiency, waste material, all of which can be achieve energy conservation by the use of broadband. For example, by reducing the consumption of goods(e.g. paper), it is possible to reduce the energy consumption involved with production and disposal and to reduce waste emissions.

Table 4 Energy savings effect of data centers

Item	Content
Consumption of goods	By reducing the consumption of goods(e.g. paper), it is possible to reduce the energy consumption involved with production and disposal and to reduce waste emissions
Electric power/energy consumption	By improving the efficiency of electric power use and reducing consumption, it is possible to reduce the energy consumption involved with electricity generation and supply.
Movement of people	By reducing the movement of people , it is possible to reduce the energy consumption of transportation
Movement of goods	By reducing the movement of goods , it is possible to reduce the energy consumption needed for transportation methods
Office space efficiency	By using office space efficiently, it is possible to reduce the electricity consumption of lighting and air-conditioning and to reduce energy consumption

Storage of goods	By reducing the storage space of goods, it is possible to reduce the electricity consumption involved with lighting and air-conditioning and to reduce energy consumption
Business efficiency	By improving business efficiency, it is possible to reduce resource and energy consumption
Waste material	By reducing waste emissions, it is possible to conserve the environment and reduce the energy consumption needed to dispose of waste

Source: Survey and Estimation Committee Green IT Promotion Council

3. Broadband Bottlenecks in Developing Region

Improving access to broadband networks requires addressing supply-side and demand-side bottlenecks.

3.1 Supply side

On the supply side, broadband requires an underlying wired infrastructure, and significant investments are required in order to deploy any wire line infrastructure. These are the key factors on broadband supply for both developed economies and developing economies.

Developed economies have been building out wired infrastructure for decades, and investment costs in these technologies such as digital subscriber line (DSL) and cable modem have already been recouped. For taking advantage of networks with greater capacity, developed economies are required to put additional investments in fibre optic networks.

In fact, many developing economies lack extensive wire line infrastructure, and investments in telephone, cable, and fibre optic networks often require new up-front costs, and have not been recouped.

Converting mobile networks to broadband readiness requires investment in spectrum and equipment by operators and the purchase of new devices by users, making mobile broadband more expensive for end users than current wireless services.

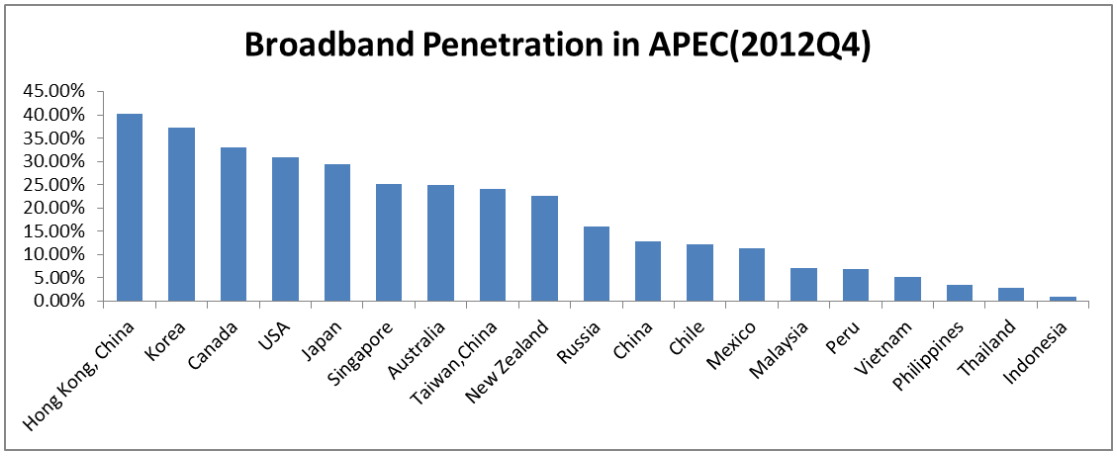
Investments in spectrum and equipment are needed for terrestrial fixed wireless technologies, and it may not be feasible to leverage the existing mobile infrastructure in terms of towers and backbone networks.

Other wireless options include fixed wireless and satellite, which are more costly than other solutions for mass deployment and has usage limitations for some applications.

3.2 Demand side

The broadband penetration of most developing economies in APEC has not been high enough to maximize the contribution to green growth, which can be seen from the figure below.

Fig. 8 Broadband penetration in APEC (2012Q4)



Source: Point Topic

Generally, broadband is also dependent on demand-side constraints such as affordability of broadband services, awareness of its benefits and attractiveness of these services, applications and content.

Encouraging use of Internet in schools and SMEs (small and medium enterprises) is much more helpful to promote and raise the awareness of benefits of broadband. Besides, training on security and privacy of e-transactions is also necessary.

Improving the affordability of broadband services can be accomplished by lowering user costs through tax reduction. Provide broadband equipment to educational institutions at cost or via subsidies has been proved to be effective in promoting service affordability.

For the attractiveness part, broadband services, applications and content with interest in local language can improve the service attractiveness for local consumers. These services can be e-government, e-health, e-education, e-agriculture, etc.

Low coverage of broadband and low incomes in some developing economies results in less demand. If these demand-side issues are not tackled, a country risks creating a mismatch between supply and demand and will not be able to fulfill its broadband potential.

4. Policy Support Systems about Broadband

Policy Support Systems about Broadband consist of establishing specific plans and policies, promoting the demand for broadband, financing broadband development, encouraging enterprise investment and broadband universal service.

4.1 Establishing specific plans and policies

For now, 127 developing economies around the world issued the economy-level broadband strategy. In APEC region, at least 19 economies issued their own economy-level broadband strategy.

For example, United States set the goals that by 2020, 100 million households with access to actual (not advertised) speeds of 100 Mbit/s and universal connections with actual speeds of at least 4 Mbit/s download and 1 Mbit/s upload. Part of the Plan addressed using broadband to support energy conservation and independence and protecting the environment:

- The FCC has implemented some of the recommendations: initiating a proceeding (Notice of Inquiry) to explore the reliability and resiliency of commercial communications networks (still open), collaborating with DOE to study the communications requirements of electric utilities to inform federal Smart Grid policy. The FCC participates in the Smart Grid Task Force, a collaboration of federal agencies to ensure awareness, coordination and integration of the federal government for smart grid development.
- DOE has developed best practices guidelines for states to use in evaluating smart grid grant applications, and is developing a report on states' progress in consumer data accessibility.
- Other federal and state agencies are working on related issues, including developing critical infrastructure protection security requirements for smart grid, and removing financial disincentives to using commercial broadband services for the smart grid.
- Some states have required electric utility companies to give consumers access to their own digital energy use information to enhance data openness and transparency.

Since the publication of the Broadband Plan, there have been many other recommendations made by governmental and non-governmental entities to foster energy efficiency, many of which apply to programs that use broadband. These include:

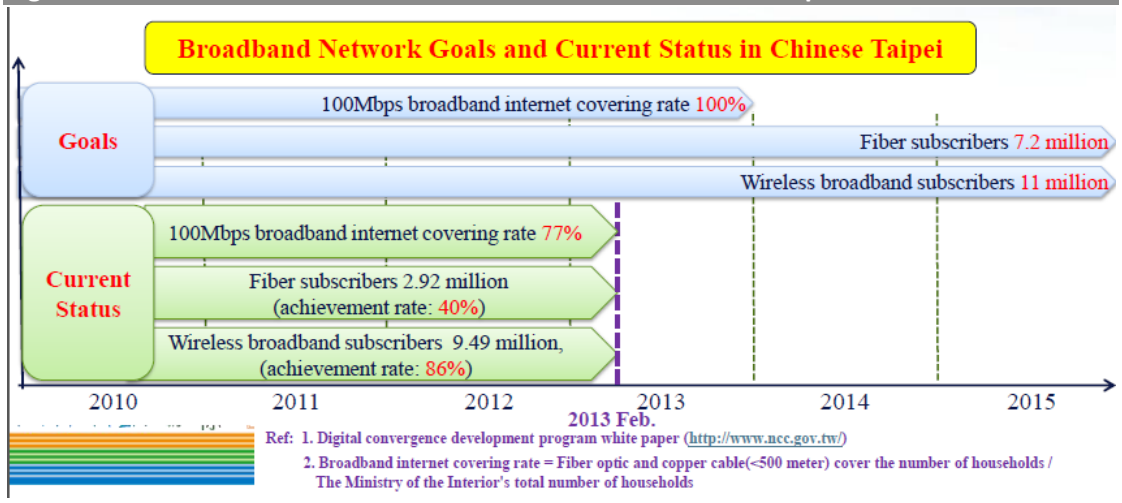
- Making financing more available for energy efficiency projects,
- Providing tax incentives to homes, businesses,
- Supporting R&D for energy efficiency and standards development for these

technologies,

- Applying best practices to government buildings, vehicles and using them as test beds and early adopters of innovations,
- Promoting competition among vendors by providing rewards and recognition for the best new products and services,
- Strengthening standards for energy efficiency within the industry, and
- Educating people on the benefits of energy saving devices and systems.

Japan issued the "i-Japan" national strategy, aiming at universal digital and information society by all kinds of digital applications focusing on e-government and information in schools and hospitals. 91% of households of South Korea get broadband access with No.1 ranking in broadband speed all over the world. The broadband penetration rate for households of Malaysia reached 75% by 2010. Chinese Taipei issued "Digital convergence development program" on 2010, to establish high-speed broadband network and accelerate the construction of fibres optic network and wireless broadband.

Fig. 9 Broadband Network Goals and Current Status in Chinese Taipei



Source: Chunghwa Telecom Co., Ltd.

4.2 Promoting the demand for broadband

The ways of promoting demand for broadband vary among the economies with different level of technically literate.

For economies with populations that are more Internet literate, it is less needed for the country to get on direct intervention for promoting demand for broadband. Broadband demand will be driven by attractive offerings such as social networking and video streaming. Expanding access to underserved communities with universal service fund support is their first priority in infrastructure build-out.

For economies with only basic digital illiteracy, lack of understanding of the Internet Governments need to step in to fill out and aggregate demand Policies to support digital

use to ensure that broadband can bring benefits.

Table 5 Promoting the demand for broadband

Focus	Policies of promoting demand
Infrastructure	• Connect schools to broadband networks • Make government an anchor tenant • Expand access to underserved communities with universal service fund support • Construct community access centers • Consider expanding universal service to include broadband
Services, applications and content	• Undertake government-led demand aggregation • Provide e-government applications • Promote creation of digital content • Implement reasonable intellectual property protections • Ensure nondiscriminatory access
Users	• Provide low-cost user devices in education • Develop digital literacy programs for citizens • Address content and security concerns • Facilitate affordability of broadband devices • Monitor service quality • Support secure e-transactions • Provide training to small and medium enterprises

Source: Summarized by China Academy of Telecommunication Research, MIIT

No "one-size-fits-all" approach will guarantee greater broadband deployment and adoption in every country. Political and economic conditions vary, and each country is endowed with different technological resources.

Table 6 Examples of fostering broadband demand

Economy	Funding Source	Description
Chile	Telecom Operator	Under the Educational Internet 2000 project launched by the Ministry of Education, the incumbent telecom operator agreed to provide Internet service to primary and secondary schools, free of charge, for 10 years
Philippines	Government	A 2009 presidential order directed the Department of Education to connect all Philippine public

		secondary schools to the Internet. The annual outlay for internet subscription is P48,000 (US$1,115) per school of some US$6.3 million in total.

Source: Summarized by China Academy of Telecommunication Research, MIIT

4.3 Financing broadband development

In the past 20 years, the private sector has been the primary vehicle for financing telecommunications projects especially in profitable areas with the market competition increasing. Nonetheless, in many developing economies, some dominant carriers continue to control markets and distort competition, setting significant barriers to entry the market. Thus, the government's primary role is to develop policies that support and encourage private sector investment, while also seeking more effective ways to regulate dominant carriers and promote competition.

Today, most economies emphasize competition and a significant role for private sector investment to spur the growth of their broadband markets. In developed economies and some developing economies, the majority of the private investment likely comes from within the economy itself. In the least financially endowed economies, however, private investment may also come from foreign sources. Governments seeking to promote broadband development in their economies should bear in mind that investors and companies around the world may be looking for opportunities to invest in good projects wherever they are located. Thus, attracting foreign private investment through appropriate incentives and a clear regulatory environment may be more important.

When governments choose to finance broadband networks, they should avoid replacing private investment or substituting for the normal operation of market mechanisms. Rather, governments should facilitate and support private sector investment and be capable of developing, promoting, and implementing timely policies based on a thorough understanding of the market. For this reason, an essential element in effectively deploying broadband is the ability to find an appropriate financing model in which government oversight and intervention are focused mainly on funding and financing only those initiatives targeted at addressing actual or expected market failures in the availability of a broadband network and at driving the early adoption of broadband services.

For example, in Hong Kong, China, the government has issued the Digital 21 Strategy as the blueprint for Hong Kong's overall development in information and communications technology (ICT). One of the major initiatives under the Digital 21 Strategy is to build Hong Kong into a wireless city. The "Government Wi-Fi Programme" (Gov*WiFi*) provides free Wi-Fi Internet access service to the public at designated government premises, and is funded by the government. As at April, 2013,

Gov*WiFi* was available at around 400 government premises with over 2,000 hotspots. The Government of Hong Kong, China, also encourages paperless transactions to reduce carbon footprint. Its electronic procurement initiative involves automation of the internal workflow and information exchange between the Government and suppliers, as well as the provision of e-catalogue and e-sourcing functions. This initiative promotes paperless transaction, enhances efficiency, contributes to a green environment and encourages private sector suppliers to migrate to electronic commerce.

In addition to private sector investment and direct funding by governments, several other options exist for economies to finance broadband deployment, including government grants or subsidies to both private and public entities and to partnerships where private funding is matched by government. While regulatory reform and private sector investment still will NOT permit a government to reach its broadband development goals, policy makers may turn to fiscal support to fill broadband development gaps. Fiscal support can be directed to a company or end users and can be provided in various forms, including cash subsidies, in-kind grants, tax incentives, capital contributions, risk assumption, or other fiscal resources.

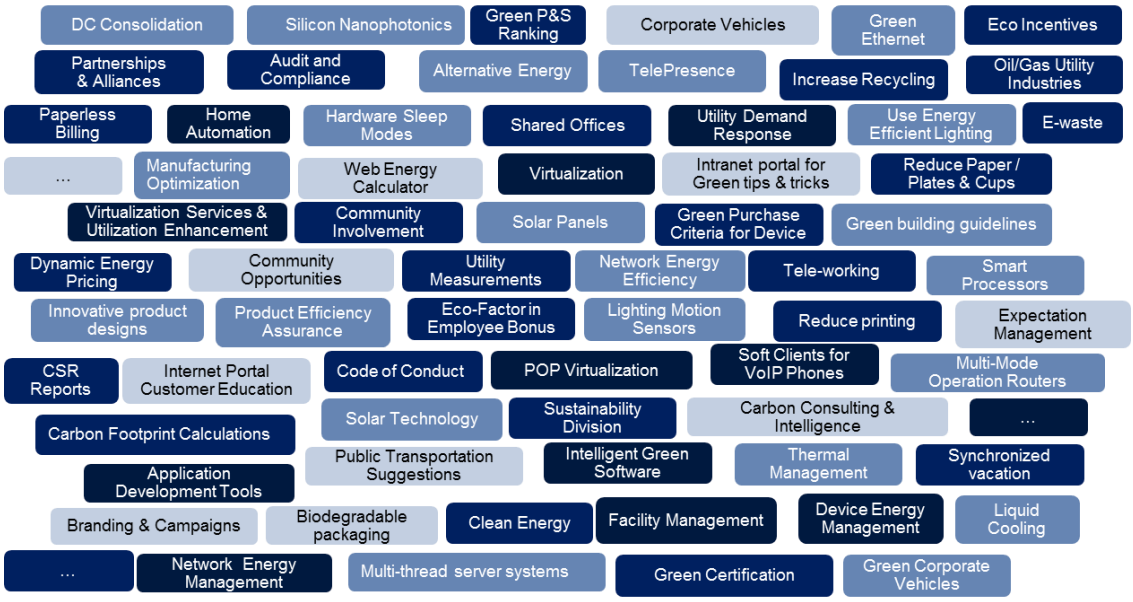
4.4 Encouraging enterprise investment

Former development of broadband has proved that investment of enterprise is predominant in broadband construction. Investment from government is all too often limited and it is almost impossible to develop broadband only on the government investment.

Thus, measures are taken to encourage enterprises invest more on broadband construction. Typical forms of encouragement are low-interest loan, loan guarantee and tax reduction.

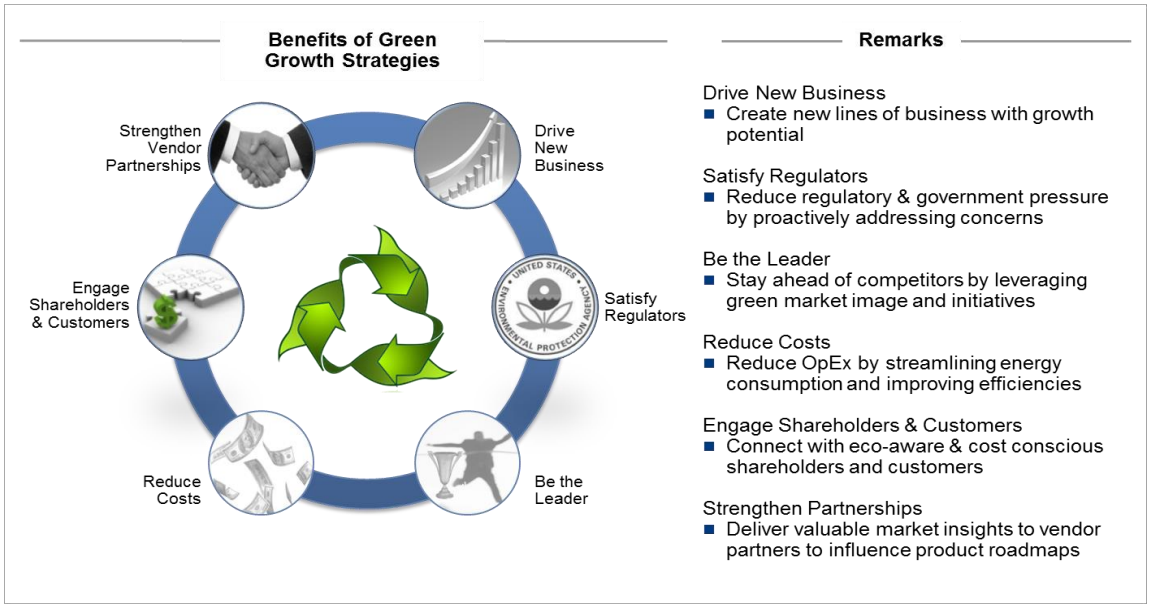
For enterprises, there are numerous measures and opportunities to enhance the sustainability of green growth in their organization and business. By adopting innovative green growth strategies in the organization, process and technology arena, they can achieve measurable improvements of their core business.

Fig. 10 Examples of Green Growth Initiatives in Operator's Organization



Source: Detecon Asia-Pacific

Fig. 11 Benefits of Green Growth Strategies for Operators



Source: Detecon Asia-Pacific

In 2000 Japan created its Information Technology Strategy Council and also established its "Basic IT Law," which was immediately followed by its "e-Japan" strategy in January 2001. In 2003, the government expanded its goal to promoting broadband demand with the "e-Japan strategy II." These programs provided a combination of subsidies, tax incentives, and low or zero-interest loans for broadband providers, triggering 220 projects in 2001 and helping to achieve the goal of offering 30 million households high-speed broadband access by 2004.

The Japanese government's tax incentives included allowing providers to depreciate during the first year about 1/3 of the cost of the broadband capital investments, as

opposed to the usual depreciation schedule of up to 22 years for telecommunications equipment. Moreover, the government reduced fixed asset taxes for designated network equipment.

With respect to subsidies, Japan government required Japan Development Bank to provide zero-interest loan to state-owned broadband provider and low-interest loan to private-owned. Operators running broadband can redeem 6-18% of business tax and reduce 20-25% of property tax.

4.5 Broadband universal service

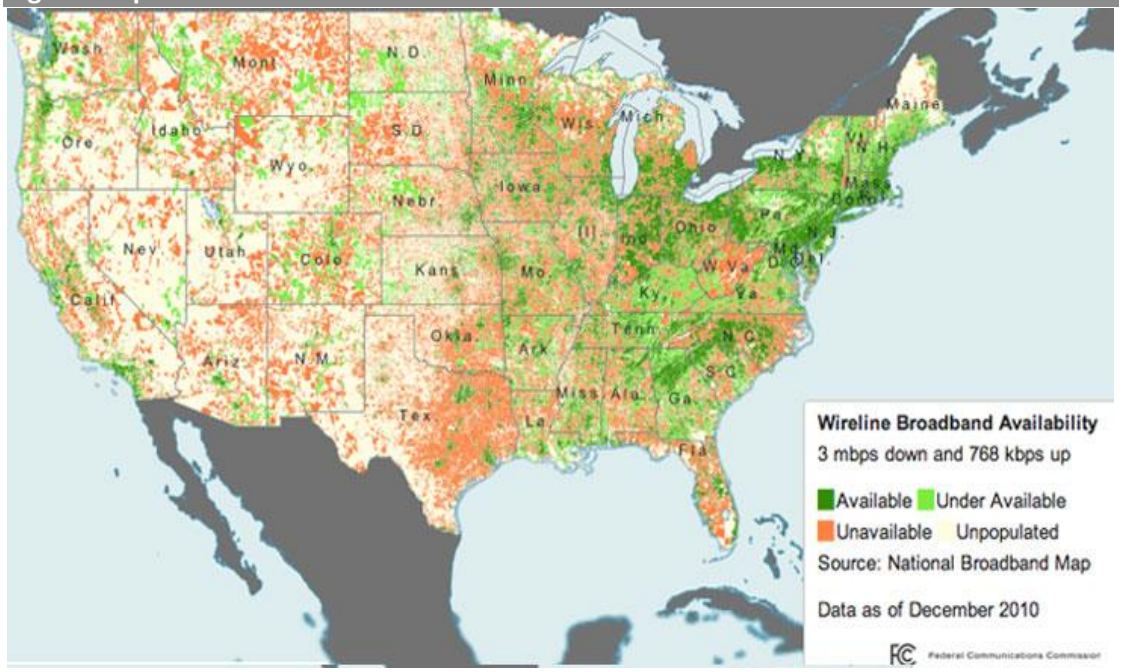
Now broadband has gone from being a luxury to a necessity for full participation in economy and society. However, even in well-working market environments, some gaps typically remain between and within economies. Despite declining costs, some locations will not be commercially viable in the near future. In places with broadband service, some users will not be able to afford it. Persons with disabilities may have difficulty using standard equipment. These are some of the situations where market forces alone are not likely to ensure access to broadband. When government steps in to fill these gaps, it goes beyond the market, which can be understood as achieving universal broadband access.

If broadband network investment is only adjusted by market regulation, rural area and uninhabited region will not get any broadband access, because of the low rate of return for broadband construction. More and more economies are taking broadband into universal service.

One typical example of broadband universal service is “Connecting America”, the national broadband plan which deals with improving broadband Internet access throughout the United States. One goal was providing 100 million American households with access to 100 Mbit/s (megabits per second) connections by 2020.

The Connecting America plan also aims at accelerating broadband build-out to the 18 million Americans living in rural areas who currently have no access to broadband. The plan ordered the incentives that building 1M/4Mbps broadband in rural area will get 775$ reward per access and broadband in rural area needs to be qualified to run VOIP and other basic applications with short delay. All these qualifications makes huge efforts for the universal broadband services across US.

Fig. 12 Map of US broadband access



Source: FCC

Generally, a key challenge in implementing rural infrastructure delivery models based on competition for subsidy is coordinating strategies among donors and among different tiers of government. A concession of a private operator, premised on a partial investment subsidy and a financially self-sustaining operation over the medium term, would be destroyed if, within a couple of years, a local municipality or a nongovernmental organization started to offer a free service in the same geographic area.

Institutional capacity is needed to establish and run a competitive subsidy system for rural infrastructure services. This includes originating and shepherding specific legislation and regulations, setting up and managing the financing mechanisms, designing and implementing the bidding processes, monitoring service development, and enforcing service commitments.

In economies with well-established public administration traditions, a well-designed program of competition among firms for rural subsidies can be implemented by a rather small team of professional and support personnel.

Long-term sustainability of the model will depend on how well and realistically the risks have been apportioned among the players and the extent to which commitments can be enforced. Since subsidies are paid early in the project life cycle, should expected revenue streams later fail to materialize, the operator may face a sustained negative cash flow and prefer to close down. Service obligations and penalties for noncompliance may deter such behaviour in some cases. Ultimately, even if construction and commercial risks are initially assumed entirely by the private operators, if they fail, the

government may have no choice but to step in and take measures to maintain service, since that was its objective in the first place.

In brief, faster and more widely available broadband is considered an important opportunity to improve education, communication, and public participation in civic affairs. The government also claimed widespread broadband access is critical for global competitiveness, economic development, national security, public safety, job creation, civic engagement, etc.

Study Report on Broadband Network Development for Green Growth

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