

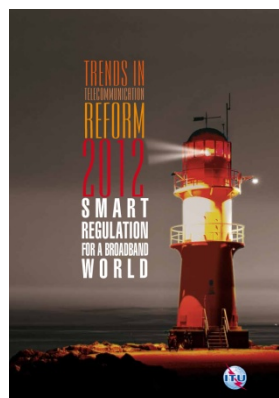
GSR

2011

Discussion

Paper

***Setting National Broadband Policies,
Strategies and Plans***



Work in progress, for discussion purposes

Comments are welcome!

Please send your comments on this paper at: gsl@itu.int by 7 October 2011.

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1 SETTING NATIONAL BROADBAND POLICIES, STRATEGIES AND PLANS

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OPENING DIALOGUE with apologies to Lewis Carroll

Regulator to ITU-D: *"Would you tell me, please, which way I ought to go from here with broadband implementation?"*

ITU: *"That depends a good deal on where you want to get to"*

Regulator: *"I don't much care where ..."*

ITU: *"Then it doesn't matter which way you go"*

Regulator: *"... as long as I get **somewhere**"*

ITU: *"Oh, you're sure to do that – if you only walk long enough"*

This Discussion Paper is designed to assist policy-makers and regulators in identifying what are essentially the common objectives and end points of broadband implementation policy and regulation. It aims to outline the core structural solutions and regulatory incentives in that policy and regulation. This Discussion Paper seeks to make the journey to a broadband future a quicker and more productive experience by discussing steps that move in the right direction. So please read on ...

1.1 Introduction

This Discussion Paper begins by reprising the fundamental principles that have guided policy and regulatory approaches to ICTs over the past two decades. The evolution of ICTs and the movement toward competition and liberalization have been accompanied by the separation of policy and regulation and the separation of regulation from operations. There has been reliance on market mechanisms to select more efficient structures and to provide better quality of service and choice to the user.

These principles have brought us to where we are today, although government intervention has been necessary to lead to where markets fear to tread. For example, government intervention is routine in cases of socially disadvantaged or uneconomic service areas

since there are little or no commercial incentives to become involved in service provision in these areas.

Broadband brings newer, broader and greater challenges, a greater scale of operations and greater responsibilities for government, the regulator, and industry. Trans-sectoral influence of broadband and the sheer investment challenges require us to appraise what we know of ICT in a fresh way so that investments are thoughtfully and carefully implemented in view of a clear and confident strategy for the future.

The case for undertaking broadband implementation on the basis of economic principles must be presented and re-calibrated. Fortunately, there is at least a common direction among most countries in terms of liberalization and sector reform that has assisted advances in the ICT sector thus far. However, there are circumstantial differences in starting points

among countries. Hence, policy and regulatory decisions and choices need to be assessed on an individual country level. Lessons can be learned, however, from other countries' experiences. A journey thus begins from each country's unique starting point and moves along an evolving decision tree, guided in part by lessons gleaned from others' experiences at each decision.

Unfortunately, there is no one set of best practices to make the task easy. Countries are in differing stages of development, and there are quite different legacy structures, incumbent strengths, liberalization and competition status, political dictates, and, most importantly, economic wherewithal. These factors combine to create a fascinating global challenge to mapping the way forward.

Whilst there may be no single panacea or best overall practice, there are many useful best examples that provide guidance about the next step forward at particular points in the general continuum of progress. Thus, bearing in mind that the majority of countries are in the developing category, it is important to feature examples from developing countries that are successfully moving forward with broadband implementation. Examples of developed countries are also useful.

The reliance on market forces forms a big part of the received conventional wisdom about managing the ICT sector and moving toward a broadband future. Yet, practical market responses, especially from incumbent operators, can radically undermine the very purposes of competition since the natural market instincts of competitors is ultimately to aspire to a monopoly position or to bring about other perverse results. Policy-makers and regulators need to balance respect for market forces with the need to prevent market failures. Policy intervention is required at periodic intervals to correct for market, structure or policy failure and to set the regulatory agenda for the next five to seven years, say, and thus provide the regulator with a refreshed mandate.

Demographics, life style trends, service experience and technology have a fundamental influence on the adoption and growth of services and markets. After all, the consumer should have the last say about services and applications, and the consumer should be able to depend on the regulator for a certain degree of

protection, fair play and oversight of quality in the market place.

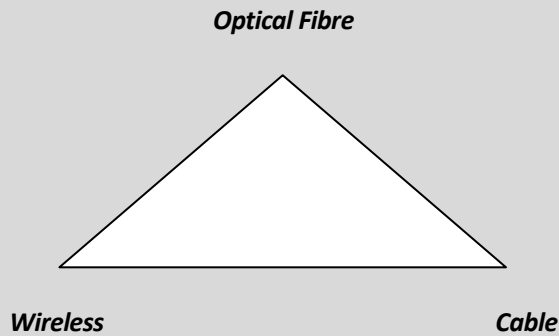
1.2 *Setting the Context*

Recently, ITU has been working extensively on studies related to the impact of good regulation on broadband development in various country circumstances.¹ These studies, particularly the country case studies, hold valuable lessons for the broadband community, and there are fundamentals which can be audited against the competition and social model of broadband planning and implementation. Whilst some of the studies cited may appear divergent to the economic orthodoxy, for instance in proposing service competition on a common platform as opposed to inter-platform competition, it is easy to recognize varying circumstances that bring about such a departure. Inevitably, with market maturity, inter-platform competition will emerge as the ultimate solution. So, in the long run, the destination is the same. However, the starting point and intermediate phase may be quite different and may be driven by policy focus considerations such as ICTs, NGNs, broadband itself, or universal service.

1.2.1 *The Case for Competition: a Reprise*

This section sets out the convergence to a future of competition which influences the industry structure, the formulation of policy and the regulatory framework.

In the long run, the most mature markets, from which end users will most benefit, are those that have enabled inter-platform competition (see Figure 1). In this infrastructure-based competition model, it is not necessarily economic to build more than one fibre-optic network, but infrastructure competition arises from either cable-based DOCSIS² (Data over Cable Service Interface Specification) systems or high speed wireless systems, such as LTE³ (Long Term Evolution), WiMax or WiMAN, or broadband satellite. This model provides a flexible, forward-looking, competitively-neutral basis for future growth. The United States, the Republic of Korea, and the Netherlands are in the fortunate position of being in this advanced stage of competition, whilst existing industry structure in other countries influences the migration and timing of the realization of inter-platform competition.

Figure 1: Inter-Platform Competition

Source: Author

This realization appears to be gaining traction around the world.⁴ In Hong Kong China, Canada, Portugal, Argentina, and Brazil, there are implicit moves involving inter-platform competition that formalize the past generation of competitive frameworks. In countries where inter-platform competition has emerged, such as in the Republic of Korea, Japan, Germany, and to a certain extent the US, there has been no noticeable market failure with regard to the development of broadband.

In a service-based competition model, industry players with little infrastructure deliver services to the market by leasing capacity from an incumbent network operator at regulated wholesale prices. Entrants to the market can set themselves up in this way as viable competitors. Once a service provider has successfully entered the market in this manner, and in the right regulatory environment, infrastructure acquisition from the wholesaler can become the first step in the “investment ladder”.⁵ So, conceptually, service-based competition – which is common in all countries and models – may be regarded as a transitional step towards inter-platform competition.

If new entrants do not climb up the investment ladder, then the competition model adopted by a country may need to be re-assessed. The competitive model selected by a country is critical to the broadband industry’s future development, and an appraisal of industry structure (existence of cable, wireless, etc.) is important in this setting. The situation of developing countries might require broader regulatory intervention in both supply and demand incentives and to provide a different focus on the technologies applied to achieving the successful deployment of broadband. Developing countries, nevertheless, stand to benefit just as much from broadband as developed countries, especially

when critical mass of service availability starts to be approached. When critical mass is approached, the effects on GDP and social inclusion increase rapidly.

There are signposts along the road to the future that need to be recognised and interpreted; these signposts arise at points where corrective policy measures can be applied. The ICT ecosystem in general is about to morph into a much more powerful and far reaching influence, with many national and international economic and social effects.

1.3 Policy Considerations

This next section examines policy considerations associated with broadband rollout, and compares some examples of different approaches and responses to the challenges ahead.

1.3.1 Emerging Policy Settings – Addressing the Infrastructure Deficit

Adequate and well-functioning infrastructure is essential to economic development and social needs. Efficient investment in the energy, water, transport and communications sectors has an effect well beyond the contribution to capital accumulation. Good infrastructure facilitates trade, stimulates market integration and competition, fosters the dissemination of ideas and innovation, and enhances access to resources and public services. The benefits are especially important where there are a geographical dispersion of population and remoteness from markets, both nationally and internationally.

Most countries currently have an ICT infrastructure deficit, partly due to historic underinvestment and partly due to an inability to keep up with emerging

demands and opportunities of the information society. Many countries around the world have promoted ICT infrastructure to the top of the economic policy agenda, however. This involves greater government expenditure, structural reforms that draw on public and private investment, and the use of existing facilities through better regulation.

Broadband is trans-sectoral in its nature. The evidence is fairly conclusive that broadband has a positive contribution to GDP and that this contribution is magnified as penetration increases.⁶ Analysis also validates the positive contribution of broadband to job creation for less developed countries and regions, despite the job-destroying influence in some sectors where there is a particularly strong capital/labour substitution and productivity gains. Notwithstanding the benefits of broadband, rolling it out is not a simple matter since broadband requires a very significant investment. Before policy and investment decisions are made, policy-makers across the board, industry, and the community must develop a deep and wide understanding of the related issues. That understanding is best achieved by widespread consultation and negotiation with the affected stakeholders prior to arriving at a national vision as the first element in developing a broadband plan.

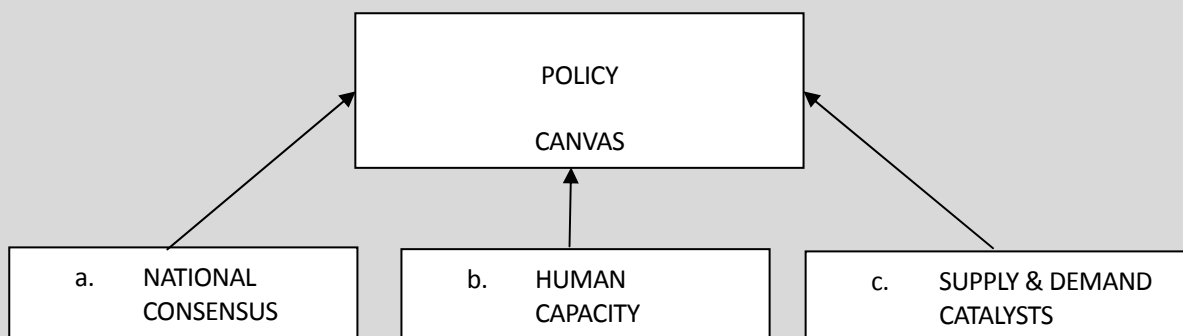
At the outset of broadband planning, both developed and developing countries must formulate an

appropriate definition of broadband and the purposes it serves in their broadband planning. This is addressed in more detail in section 1.4 of this paper, which looks at a more fulsome definition of broadband. This definition should be of value in assessing the true benefits of broadband in environments as diverse as the US and Fiji.

Once there is agreement on what broadband is about and how it is characterized, it is necessary to assess possible approaches to drafting a national vision. At this stage, it is important to identify and to elaborate on a number of policy considerations, simply summarised in Figure 2.

The public policy framework for rolling out broadband must take into account the magnitude and extent of the tasks involved and a broad cost-benefit analysis of the measures needed. This framework can be used to assess the costs of the infrastructure required. Alternatively, a top-down approach would entail a budget for the purposes of broadband rollout and a subsequent assessment of priority implementation within that budget. A further approach that is becoming popular is to set targets, such as coverage, speeds of access, and concessions, for which public and private investment may partner to achieve. This last consideration is common to all approaches to a varying extent.

Figure 2: Broad Policy Considerations



- a. Building a national consensus and evaluating the implications and opportunities for broadband across many sectors and society. A cross-sectoral view is highly important.
- b. Developing the human capacity to ensure a successful deployment and uptake of the use of the infrastructure.
- c. Creating the supply and demand catalysts for government, big and small enterprise, and the individual citizen.

Source: Author

Universal access raises special considerations that must be taken into account in broadband policy given the social, economic and political importance of ensuring universal access to key infrastructure developments. In otherwise uneconomic, underserved or unserved areas, there is a general case for government intervention through various mechanisms. These areas can sometimes be critical to the economy, especially in rural environments. Other disadvantaged parts of society that would otherwise be left as an untapped resource could benefit enormously from training and capacity development, which, in turn, could then exploit broadband.

Broadband does not in itself have an economic impact; it must be accompanied by an accumulation of intangible capital. This is especially true in developing countries. Broadband requires the introduction of processes, organizational changes, training, and accounting for cultural factors. Thus, governments need to emphasize the need for training programs, resource centres, and consulting services where small and medium enterprises (SMEs) can learn to extract the full benefit of broadband.

Other factors that should be addressed in a national vision for broadband include: cyber security; incentives for investment, the development of a regulatory framework that encourages fair and attractive services while boosting innovation; methods of monitoring broadband developments to assist in the formulation of further policy measures in the future; and the initiatives a government foresees for stimulating demand through harnessing government services in the broadband developments.

The ultimate vision or policy statement will capture the future picture of the place of a country in the information society. It should successfully address the digital divide and show the way forward by demonstrating how the government will navigate the economic and social future for its citizens and industries.

The first step in creating a national broadband plan is the prelude to an exciting and inclusive future. The next section provides some examples of policies from developed and developing countries that may be instructive.

1.3.2 Overview of Existing Policies through Selective Examples

Prior to considering the approaches to a national broadband plan, and to assist with finding coherence amongst a diversity of plans and policies, it is helpful to review some existing policies from, in the first instance, more advanced countries or regions. This section will provide an overview of such policies and a comparative analysis of selected examples. These examples include the US, Germany, the Republic of Korea, Japan, Australia, and New Zealand.⁷ This discussion will also point to why seemingly different policies and plans have been devised.

It is also instructive to consider case studies of some developing countries, for instance, Brazil, Argentina, the Dominican Republic, Fiji and Papua New Guinea.⁸ Hong Kong China is also interesting, as it provides an advanced insight into the future of a high density, competitive environment. Further, there are useful examples of ICT policies from Africa, Eastern Europe and the Arab states that are referred to briefly in the Decision Tree discussions in section 1.4.1 below. A review of these cases enables an identification of various similarities and differences between developed and developing countries in formulating broadband plans.

Before proceeding to a discussion of these cases, it is helpful to note that a major driver of policy decisions on funding broadband growth in many countries has been the 2009 global economic crisis. In the wake of this crisis, many governments have implemented policies and programs using broadband deployment to stimulate employment.

(a) United States: Economic Stimulus Program

Both a targeted and a direct subsidy approach have been applied to broadband implementation initiatives in the US.

Following the adoption of the *American Recovery and Reinvestment Act (2009)*, the US created a USD7.2 billion broadband stimulus program focused on providing services to unserved and underserved areas. There are 18 states that lag behind the national average of broadband penetration. Studies⁹ have indicated that the program should eliminate this lag and generate up to 263,800 jobs over the four year implementation time. The jobs are a result of direct network construction and

indirect or induced multipliers across the economy over the four year period. The policy is therefore a short-to-medium term response to an immediate economic situation.

(b) Germany: Employment and Economic Growth

Germany has a two-phase general plan for targeted penetration and speeds.¹⁰ First, the “National Broadband Plan”, announced in 2009, aims to provide 75 per cent of German households with at least 50Mbps access by 2014. Second, an “Ultra-broadband” plan for 2015-2020 aims to provide 50 per cent of households with at least 100Mbps access and another 30 per cent of the remaining under-served and unserved population with 50Mbps access by 2020.

It is estimated that the evolution to ultra-broadband will have a significant impact on GDP and jobs. An investment of EUR 36 billion is expected to yield 968,000 jobs. From an incremental economic growth standpoint, network construction will yield additional value-added of EUR 33.4 billion, whilst network externalities will result in an additional EUR 137.5 billion. This demonstrates the raw cost-benefit analysis underpinning the plan that allowed Germany to proceed with confidence in the implementation of its two phase broadband plan.

(c) The Republic of Korea : Holistic Character of Policy and Planning

Many developed countries have a heavy emphasis on “build it and they will come”. However, the Republic of Korea helps to lead the way with its “ICT Master Plans” which are designed to facilitate the transition into an advanced information society.¹¹ These Master Plans are five year plans that first began to be adopted 1995. Their objectives range from broadband universalization to becoming a global IT leader.

Planning vectors include not only the deployment of broadband infrastructure but also services, applications and demand promotion policies. The emphasis on demand promotion differs from the plans in most other developed countries, where demand stimulation is left to market forces.

With such a holistic approach, the Republic of Korea is able to address the inter-connected areas of services and applications with the built-out of broadband networks in order to refine a broadband

strategy and technology assumptions based on more rigorous analysis.

This underlines the importance of the initial stage of defining a consensus around objectives and values that link technology adoption to economic and social objectives. Once this consensus is achieved, it is then critical to engage policy makers with civil society as part of a public debate towards a shared vision. Following the accepted vision, the definition of targets based on rigorous analysis of investment and social and economic returns can be formulated.

(d) Other Long Range Thinkers

Japan¹², like the Republic of Korea, also has a sector-wide planning tradition. Japanese strategic planning in the broadband area goes back to 2001, with the first e-Japan Strategy. Annual priority policy programs in Japan focus on implementation, such as the universalization of broadband.

Sweden and Estonia provide additional examples of the influence of broad policy planning on broadband implementation and participation in the Information Society. The countries in this category do not appear to have a common link except that they are experimenting in similar ways and thus contributing to regulatory evolution in a positive fashion.

(e) New Zealand : Greater Intervention

In 2010, New Zealand embarked on a number of policy initiatives to overcome the perceived historic shortfalls of market responses to the needs of broadband.¹³

The Ultra-fast broadband initiative involves the investment of NZD1.5 billion in a program of public-private partnerships for the construction of fibre-to-the-premises access networks connecting 75 per cent of New Zealanders. In parallel, a Rural Broadband Initiative will involve NZD300 million of direct funding to improve the availability of fibre backhaul links in less-urbanized parts of New Zealand. A Complementary Measures Work Program involves measures to streamline and coordinate infrastructure deployment and also to aggregate demand for enhanced broadband networks.

These initiatives have involved broad consultation processes, and they have been embraced by the private

sector, including the incumbent provider. These are positive signs for future investment and deployment.

(f) **Australia: A bold step forward**

In 2010, Australia embarked on the construction of a National Broadband Network with a total funding estimated at AUD40.9 billion over 8 years to build and operate a new open access wholesale network. This network will comprise fibre optic connections to 93 per cent of homes and workplaces, with the remaining seven per cent of homes to be provided broadband services by wireless and satellite solutions.

The 93 per cent of homes, schools and workplaces will receive broadband speeds up to 100 Mbps. Other premises will receive speeds of up to 12 Mbps using wireless and satellite technology. The plan will support up to 25,000 jobs over the life of the project.

Funding will initially come from government, which will contribute equity of AUD27.5 billion, with other funding expected to come from operational earnings and private debt. In 2015, the wholesale network provider (NBN Co) will begin raising funds through capital markets, with an estimated AUD13.4 billion expected to be needed to finance the project.

There are some concerns¹⁴ that the plan picks technology winners and represents a re-monopolization of a national access network at the wholesale level, with some effects on competitive backbone provision. There are also concerns that the plan lacks a public cost-benefit analysis in advance of policy decisions, backtracks on competition principles, and may cause stranded investments for some operators.¹⁵ There are also some doubts that a government monopoly can operate efficiently.

In response, the government's philosophy is to claim that the plan treats market failure, especially incumbent resistance to investing in broadband infrastructure. The government further argues that its solution to broadband investment will also facilitate the development of competition. The intention is to privatize the asset back into the marketplace on completion of construction and thereby to return to a market discipline (a form of BTO¹⁶ but on an open access basis). In the meantime, the growth of service competition may be better served by the wholesale platform, and could conceptually form the basis for future inter-platform competition.

Developments in Australia represent government intervention not only for purposes of universal access, but in the mainstream development of a national platform for broadband. The experiment will attract a lot of interest and scrutiny in future years.

(g) **The Dominican Republic : Bringing Broadband to Rural Areas**

A case study¹⁷ of the Dominican Republic reveals some important differentials for developing countries. For instance, where there is limited or no access to basic voice services, the Internet becomes a less expensive solution for voice. Another distinction from developed countries is in the application of universal access funding to achieve not only greater access service, but also to provide and to install terminal equipment such as computers, PDAs, smartphones and other devices that use the broadband connection.

Launched in 2007, *e-Dominicana* is the Dominican Republic's national broadband strategy. This strategy is divided into eight thematic areas: infrastructure and access; social inclusion; education; training; awareness-raising; development of content; digital state; and industry. The strategy addresses coverage and speed targets, as well as consultation with operators, service providers, public institutions, local entities, NGOs and other agencies.

By far the most important part of the strategy is the establishment of community Informatics Training Centres and supplying them with computers. The main purpose of these Centres is to train people to use a computer. Young people are seen as a valuable future resource. Some of these Centres already have connection to the broadband Internet.

This strategy highly recommends to undertake a pilot project as a pre-feasibility test to the plan because, as is the case in many developing countries, there is little primary data to assist planning. However, proxy or secondary data on population statistics and Google Earth maps have been found to be of significant value in planning and evaluating the subsidies and contract schemes that will be necessary. The contracts for the build out of networks are based on public-private partnerships.

In *e-Domenicana*, technology neutrality is stressed. However, radio advances hold out the most promising solutions for distribution and backhaul to urbanized areas. This stands in contrast to many developed

countries where optical fibre is seen as the main national driver, with wireless or mobile as an adjunct or perhaps competitive alternative.

In Summary

Some of the features of the examples outlined above are summarized in Table 1.

Best practices evident in the formulation of broadband policy involve the articulation of a wide consensus which forms the basis for the creation of targets based on a depth of economic analysis. The integration of broadband goals with other service and application areas in the ICT ecosystem is important, as is the definition of actions of government to assist both supply and demand factors.

In devising targets, a range may be more appropriate than hard limits so that markets and consumers have the flexibility to move to the most efficient solutions for their needs. This is particularly appropriate for developing countries.

1.3.3 Drafting a National Broadband Plan

This section considers the possible approaches to formulating a National Broadband Plan. There are

numerous considerations which go into the formulation of a National Broadband Plan, including:

- a. Main characteristics of the Plan;
- b. Different goals to be addressed;
- c. Need for substantial evidence for decision making;
- d. Means for implementing the Plan;
- e. Entities involved and their roles;
- f. Industry structure and regulatory measures to stimulate involvement;
- g. Models of financing the implementation, based on economic analysis;
- h. The need for cross-sectoral considerations;
- i. Top-down versus bottom-up considerations to setting targets; and
- j. Technology neutrality.

The choices made concerning each of these elements will depend on country and local market circumstances. This will be considered in section 1.4, which introduces the concept of a Decision Tree.

Table 1: Comparison of example countries

Country	Year	Name of the Plan	Vehicle	Horizon	Goals	Benefits
US	2009	Broadband Stimulus Program	Stimulus Program	Short term	Raise national average	National recovery
Germany	2009	National Broadband Plan	Two phase plan	Medium to long	Dual targets of penetration	GDP growth and jobs
Republic of Korea	rolling	ICT MasterPlan	Broad consensus	Long term 5 yr stops	Global leadership	National growth
Japan	rolling	i Japan Strategy	Broad consensus	Long term	Global leadership	National growth
New Zealand	2010	UFB and RB initiatives	Broadband Plan	Medium term	Economic development	National growth
Australia	2010	NBN Plan	Nat'l B'band Network	Medium term	Infrastructure platform	National growth
Dominican Republic	2007	eDomenicana	Universal service	Short to medium	Extend infrastructure	National development

Source: Author's research

1.3.3.a Main Characteristics of a National Broadband Plan

A National Broadband Plan encapsulates the realization of the policy vision with a strategic agenda of goals, timing, resources, and the continuous involvement of affected stakeholders in its formulation. This section broadly outlines the considerations that should go into the creation of the Plan.

By its nature, the Plan needs to be forward looking with a detailed outlook of, say, five years, after which technology solutions may have radically changed, but cast in a longer time frame, beyond electoral cycles. It can be expected that the policy framework will be significantly influenced from time to time by politics of the day. However, this influence is usually focused on the targets set and responds to particular sectors of an electorate or to times of economic crisis. It is important that the Plan is essentially robust to the checks and balances brought about by politics. If endorsed by all policy-makers at the time of conception, a National Broadband Plan should become a permanent fixture of ongoing economic development and the embodiment of a shared vision.

The Plan should have goals and broad implementation strategies that lead to a blueprint for their realization. The Plan should highlight the importance and the respective roles of public and private sector participation and the potential for partnerships.

It is generally expected that the private sector should assume primary responsibility for investing in the development of broadband. However, this may not always be the case, and a central role for the public sector may be needed at least for a temporary period. Addressing market failure and the need for intervention with universal service objectives and strategies will be an ongoing role for government.

Government has a critical role to play in setting the framework for collaboration. Government need to foster a clear understanding of the roles of various stakeholders and promote consultation amongst all stakeholders and government agencies (such as the Ministry of Health, Education, etc.) in advance of policy setting and implementation. This inclusive approach recognizes the future widespread benefits from ICTs and broadband.

The involvement of government in broadband development on the supply side often dominates

considerations. However, during implementation, there is an important role for government in assisting demand aggregation and in capacity building in readiness for the broadband opportunities that lie ahead. Demand aggregation through the offering of government services online and capacity building or training through community centres is a distinctively valuable feature of a Plan in the developing country context, as demonstrated by the cases of the Dominican Republic and Fiji, for example.

1.3.3.b Different goals to be addressed

It will be necessary to identify the different goals of the Plan and the means and intervention models through which they might be pursued. Goals may include, for example, universal access and associated guarantees; creating incentives for competition and innovation through government policies and regulatory means; creating new industries, exports and jobs; and economic growth. Other important goals that need to be identified involve benefits for consumers and end-users.

Most Plans address the models of public and private investment and the need for universal access measures through geographic segmentation. In the UK, for instance, Ofcom differentiates between “black” areas (where platform-based competition exists and good broadband service is expected), “grey” areas (where at least one service provider is expected to offer service, though quality may be inconsistent), and “white” areas (where service is not available). In common with the UK, many countries set out the principles of private competition and goals and incentives of the regulatory structure in their equivalent of the black areas, and some grey areas, whilst focusing government investment resources on the market failure of white areas.

As indicated in the previous section, the National Broadband Plan should address the role of government entities in contributing to either the demand or supply side of developments. On the broad front of the influence of the Plan is an articulation of the respective roles of these specific government entities in achieving the penetration goals and successful uptake of broadband.

Broadband rollout targets can be hard limits specified as percentage penetration levels, as is the case in many developed and developing countries, or speeds that represent the boundaries of technologies

that can be reasonably afforded. Alternatively, the targets can be a combination of both these objectives or, most likely, a tiered approach that takes into account geographic factors and likely market supply responses combined with government complementary measures.

Target percentage values vary. In developed countries, they are often set at 50 to 100 per cent, and some dual targets are often created. In developing countries, penetration is a critical factor and starts at lower levels but can be graded up from these lower levels with time. A cost-benefit analysis should precede the setting of targets, with consideration being given to both the economic benefits and the more intangible value elements of social benefit. Other factors such as pricing and the relative importance of the pricing factor to both developed and developing countries, are treated in the second half of this paper.

1.3.3.c Need for substantial evidence

Broadband rollout targets should be transparent and amenable to market and social analysis. They should be economically justified by a cost-benefit analysis and agnostic to political cycles as broadband infrastructure must be seen as a long-term undertaking. Targets should be sound, realistic and reasonable. However, they are not necessarily portable between countries.

Potential demand studies that aim to estimate the level of demand at determined prices that are attractive to the population are required. Once such demand studies are completed, there should be an estimate of the minimum level of investment necessary to satisfy this demand and the potential rates of return required to satisfy investors and operators. For rural and other underserved areas, the next step is to determine the amount of subsidy that might be required to incite investment by industry, followed by consideration of the policy and regulatory incentives to complement industry investment.

In developed countries, the econometric modelling to prepare the ground work for setting targets is based on experience in other countries that are leading the way in broadband deployment, such as Germany, the Republic of Korea, and Japan. The modelling is also based on in-country statistical information, often historically accumulated by the regulator and policy-makers in the country.

However, there are often barriers to obtaining reliable demand estimates in developing countries, especially in their rural areas. These barriers include the difficulties and costs of obtaining primary service data and the scarcity of historic traffic data. This creates challenges for setting rollout targets. In these cases, demand studies may sometimes be impossible to obtain unless the obstacles can be overcome in some other way.

To overcome these obstacles, some regulators, for example, in Peru and the Dominican Republic, use a practical, less complex, proxy approach that can be applied in countries where there are already some telecommunication networks in rural areas. Since most countries in the world have at least some network rollout in rural areas, this approach is widely transferable. This approach involves superimposing a known, working rural example (e.g., of telecommunication and Internet usage) onto the demographic distribution of all rural communities throughout the country.¹⁸ The uptake of service in a known example provides a proxy evaluation and is derived from a part of society which has some idea of the meaning and relevance of broadband.

Pilot projects also have significant value in countries where there are barriers to obtaining demand studies. Pilot projects can play a vital role in stabilizing the estimate of demand. Case studies of other developing countries that may have already moved ahead in rolling out broadband are also of great value. Both pilot projects and case studies contribute to making up for a lack of historical traffic and service data for econometric analysis. Indeed, these observations are also true of developed countries, which have the benefit of pre-existing data on their country.

Formulating targets requires realistic and future measurable outcomes so that corrective measures might be put in place before too much damage is done. These considerations should therefore be built into the regulatory framework so that industry statistics can ensure an efficient audit of implementation and provide added guidance for future policy decisions.

1.3.3.d Means for Implementing the Plan

Implementing a National Broadband Plan requires consideration of deployment strategies and a facilitating regulatory environment that remains sensitive to the overarching ambitions of the Plan.

The prevailing philosophy of government intervention in underserved markets is conditioned by the history of extending service penetration using universal service policies in wireline communications for voice. Ultimately, the primary funding for broadband should be privately based. However, in the meantime, many markets are not sufficiently developed to offer sound financial investment opportunities and government intervention is therefore necessary to rollout broadband service. There are two approaches available to government in these circumstances. First, government may directly enter the market as a service provider and later privatize operations. Second, government may seek to generate the necessary stimuli for private investment and take a share of the risk through public-private partnership arrangements. In addition, direct subsidies may be applied, especially if the needs relate to Universal Service and there is a fund in place. Both direct entry and public-private partnership arrangements should be seen as a temporary intervention to correct for lack of supply incentives, though more permanent subsidies may also apply to disadvantaged regions or members of the community.

As a more permanent feature, government can make a valuable contribution to broadband rollout through demand-side policies to promote broadband adoption. For example, as an aggregating anchor tenant, it can contribute to demand through government e-services for health, education, public administration, and public safety and through the establishment of training centres to spread broadband expertise and knowledge. The latter is especially useful to SMEs seeking to adapt broadband to their needs. Government involvement in these ways establishes a demand for broadband that is attractive to investors.

1.3.3.e Entities Involved and their Roles

The Plan should specify the roles of the sector Ministry, the regulator and other government agencies that may be involved in broadband rollout. These roles may include providing financial incentives for investment in situations of market failure, for example. The Plan may also address the regulator's responsibility to nurture market and consumer developments in a more dynamic sense. The roles of the regulator, the Ministry, and other government agencies are generally complementary to each other.

1.3.3.f Industry Structure and Regulatory Measures to Stimulate Involvement

The natural market instinct of competitors in a healthy market is to grow the business, increase vertical integration, to innovate on an ongoing basis, and to maintain investment as technologies and network solutions mature. A strong competitive environment produces market forces that ensure these outcomes and that provide related benefits to consumers and end users in terms of genuine choice in price, quality and range of service. Users in the digital world also have needs related to security and privacy, and for these needs, they rely on the policy-makers and regulators to look after their interests.

From the outset, competitive market ideals are somewhat distorted in the telecommunication sector as legacy provision of service has been through what was originally regarded as a natural monopoly of infrastructure provision. The structure of the telecommunication industry is still generally asymmetric at present, with a strong incumbent matched up against new entrants to the business. This is the essence of the regulatory challenge in introducing competitive dynamics into the market.

In many countries, regulators have been given and now use tools for regulating access, interconnection, and market behaviour. These tools often include schemes of negotiation/arbitration and lighter regulatory requirements such as codes and standards. At the same time, the incumbent has quite often honed and applied techniques of denial, delay and disruption to frustrate the growth of competition. This is a natural reaction for a competitor in any market. Because competition is not yet strong enough to discipline the incumbent, the incumbent can game the regulatory process to the frustration of the regulator and disadvantage of the community. In fact, Sun Tsu¹⁹ would have been proud of the efforts of many incumbents.

Unfortunately, many incumbents have applied their creative talents to the protection of their historic position and have purposely avoided significant new investment, which in itself might benefit new entrants. Their innovation has been allowed to dwindle by running down research and development capabilities and surrendering these initiatives and associated international technical influence to the manufacturing sector. In turn, the manufacturing sector has embraced the opportunity, but has been reluctant to enter the

policy debate. On the consumer front, it would be true to say that incumbent culture still has a long way to go in realizing customer satisfaction and trust.

Given that the starting point in the telecommunication sector is less than ideal, many preliminary efforts to regulate for a competitive market have foundered and resulted in market failure or otherwise disappointing results. Some countries have resorted to operational or structural separation of the incumbent in order to re-set the industry framework. This has occurred notably in the UK, New Zealand, Singapore and Australia. This has been a determined policy choice to augment the regulatory structure, and “sticks” such as the potential denial of spectrum access have replaced carrots in managing incumbent incentives.

A major lesson of the recent past is that incentives need to be built into the regulation of access, interconnection and market behaviour in order to encourage new entrants to move up the value chain. Entrants need to acquire capital assets progressively as they achieve customers and revenue growth. Finally arriving at extensive competition has the benefit of making the next generation of technology and services a contestable market, which is to the ultimate advantage of users. The concept of the “*ladder of investment*” is very useful for regulators as they seek to guide service providers and provide them with incentives to continue to move toward investment and competition in infrastructure. In the fixed wireline market, this might be best achieved by requiring an open access wholesale network platform, operating at Layer 2 (data link) of the 7-layer OSI structure.

The way in which a broadband platform may be realized depends on the starting structure of the national telecommunication and ICT industry. Herein lies a further policy choice between either a subsidy-driven and programmatic approach on the one hand or a more organic (or freely developing) market-driven approach on the other hand. The Republic of Korea and Australia are both examples of countries that have adopted the former approach while Hong Kong China and India are examples of countries that have favoured the latter approach. Some countries like Sri Lanka have gravitated from an initial programmatic strategy to a more organic approach. It appears that the model adopted by the Republic of Korea is not readily transferrable to many developing countries. The government has a role to play in both approaches, but its role differs in each case.

Hong Kong China offers a refreshing approach that features a deregulated pricing environment. The guiding principles of government policy are simple: “big market, small government” and “market leads, government facilitates”. A mini case study on Hong Kong China is available in section 1.5.5 below.

One thing in common with the need for regulatory intervention in all countries is the issue of universal service. Again, a number of policy choices concerning universal service exist. The regulatory incentives and approaches that can provide desirable responses are discussed further in section 1.4.

1.3.3.g Models of Financing the Implementation of Broadband

The different models for financing the implementation of broadband infrastructure are influenced by legacy ICT infrastructure and industry structure, which in turn shape the extent of direct government involvement in the implementation. The choices for government are diverse, but generally include public-private partnerships and the adoption of facilitating measures which government can bring to the investment table. Where competition exists between vertically-integrated operators that manage their own network infrastructures and have sufficient stand-alone capacity for investment and innovation, the roles of government and the regulator are limited to facilitating fair market competition and ensuring timely and prudent access to public resources such as spectrum and property rights of way.

Regulators have a responsibility to allow and to encourage infrastructure sharing amongst competitors. This alleviates cost pressures, especially where replicating broadband infrastructure is not sustainable.

Where private investment is reluctant to enter the market, the government can take some of the risk through public-private partnerships. Such partnerships may involve the incumbent or new entrants working with the government on a contractual basis. These public-private partnerships effectively act as a temporary wholesale monopoly, but they operate on the basis of open access principles, a characteristic that distinguishes such partnerships from the traditional PSTN monopoly. The partnerships are designed to be phased out as competition increases.

New Zealand has adopted an innovative public-partnership arrangement. According to the terms of the

partnership contract, the State (the Crown) begins with 100 per cent control of the enterprise and is progressively bought out by the commercial partner as uptake occurs. Capital is returned to the Crown through this process, and this capital can then be re-invested in the Ultra Fast Broadband networks being developed. This is essentially a rotating line of credit.

Forms of subsidy also exist in developing countries. In the Dominican Republic, for example, subsidies are applied where market forces are not adequate to deliver network development and services and where public policy concerns justify public funding or redistribution of resources. A particular vehicle, known as an output based subsidy²⁰, is often used, and subsidy auctions are performed.

Many developing countries now impose a universal service levy, and the resulting universal service funds could be applied in the future to bring broadband to underserved and unserved areas under contractual partnership with government.

The experience of Australia and the Republic of Korea with providing subsidized development has been discussed above. In contrast to Australia and Korea, Hong Kong China relies extensively on market forces to address broadband rollout. Notwithstanding the universal service obligation in Hong Kong China, a comprehensive review conducted in 2007 concluded that the scope of universal service should not be extended to cover broadband Internet access. Private industry was of the clear understanding that it would pick up all cases of broadband access as a matter of course in market developments. There are nevertheless some one-off direct social subsidies from government.

The choice of approaches and government responses is discussed further in section 1.4.

1.3.3.h The Need for Cross-Sectoral Considerations

Many sectors and government ministries are stakeholders in the broad vision of the broadband future. In promoting broadband adoption, demand-side policies might involve tax incentives, the development of various e-government services, an enabling environment for SMEs, industry, export incentives, and the development of human capacity and resources. The efficient design and implementation of these policies requires an overarching strategy that features wide collaboration among stakeholders and

the development of cross-sectoral measures, in addition to education and training initiatives aimed at the broad base of society.

1.3.3.i Top-down versus Bottom-up Considerations in Setting Targets

Setting broadband rollout targets may involve top-down considerations, for example, where a given budget is set aside for broadband developments, or bottom-up considerations. Bottom-up considerations assess the resources that are necessary to achieve a particular outcome. Top-down and bottom-up considerations are addressed in more detail in section 1.4.

1.3.3.j Other issues: Technology Neutrality and a National Champion

Other issues to be considered include the benefits of a technology neutral approach and the risk of selecting a national champion for what will be a protracted period of time in the construction and implementation of the broadband network. It is particularly important for the rollout of service to rural areas that technology choices are not imposed on the operators and service providers that will ultimately be responsible for building and operating these networks. In general terms, it is also appropriate that developing countries give serious consideration to mobile and wireless broadband as a key solution to addressing the digital divide. There appears to be a continuous increase in wireless broadband services in developing countries with the deployment of 3G-enabled handsets and devices.

Amongst developed countries, there are those that are already in a fortunate position to have strong inter-platform competition between cable (DOCSIS-based) systems, fibre-optic systems, and wireless systems evolving to the 4th generation with LTE or WiMax. This forms a firm foundation for healthy competition in the marketplace. It has also been observed that whilst regulatory attempts in those countries have been biased towards service-based competition, competition in services has had less impact on developing a competitive market than the inherent facilities-based competition already in existence in their markets; indeed, service-based competition has seen a deceleration of investment.²¹

Likewise, in other developed countries where optical fibre for FTTx and backbone needs is seen as the

wholesale platform for future growth of competition, there is nevertheless recognition of a continuing role for alternative technologies. Wireless, satellite and cable-based technologies continue to have relevance in these countries, and there is an acknowledgement that the market should determine the extent of demand for these platforms.

This discussion highlights the importance of technology neutrality in the formulation of a National Broadband Plan. Not only are the choices about the “right” technology very complex, but ultimately, the most beneficial competitive environment for end-users will likely feature inter-platform competition among multiple network providers.

In Conclusion

The first three sections addressed the fundamentals of competition in the modern environment of broadband. Emerging and existing policy challenges were examined, along with an overview of the characteristics required of a National Broadband Plan,

What is clear is that there is a pressing need for broad consultation against a framework of policy concerns when undertaking a project of the size and importance of national broadband implementation. We can learn much from what various countries around the world have done in their National Broadband Plans. However, successful implementation of broadband also requires a particular view to a country’s unique national concerns and characteristics. These factors will be analysed in the following section.

1.4 Searching for Best Practice

This section introduces and develops the concept of a Decision Tree as a tool to assist in making choices in the course of implementing broadband on a national basis. It then moves onto the considerations that apply to the decisions to be made as the tree is ascended.

The Decision Tree has six levels of decision points. These decision points serve as a checklist of the elements that should be considered when creating a National Broadband Plan.

In the course of considering the Decision Tree options, a comprehensive definition of “broadband” is set out as a critical element to ensure that goals and strategies will have the most meaningful relevance to both developing and developed countries.

After considering the pros and cons of each decision node in the Decision Tree, observations on “Best Practice” are drawn up in Table 2 in section 1.4.9 below. Table 2 also points out some contrasts between developed and developing country approaches and circumstances. This highlights the need for adopting country-specific approaches in order to achieve the full benefits of broadband and its value to future national economic and social development.

Table 3 concludes by presenting a summary of the position of many countries at present. The Table includes both developed and developing countries and draws on the Case Studies that are presented later in section 1.5. The Table also relies on survey material made available by the ITU.

As alluded to earlier in this Discussion Paper, there is no single set of best practices for rolling out broadband. There are numerous levels of complementary decisions that apply to drawing up a National Broadband Plan, and there is a wealth of information throughout the world from countries that have already taken decisions on a number of these levels. Valuable information is also available from other countries that are contemplating such plans and from still others that have some of the challenges ahead of them.

These decision levels are set out in the form of a Decision Tree, which is explained in the next section.

1.4.1 The Decision Tree

The Decision Tree is a decision support tool that uses a tree-like model of decisions and their possible outcomes or consequences.

A Decision Tree comprises three types of nodes:

- decision nodes (represented by squares)
- chance nodes (represented by circles), and
- end nodes (represented by triangles).

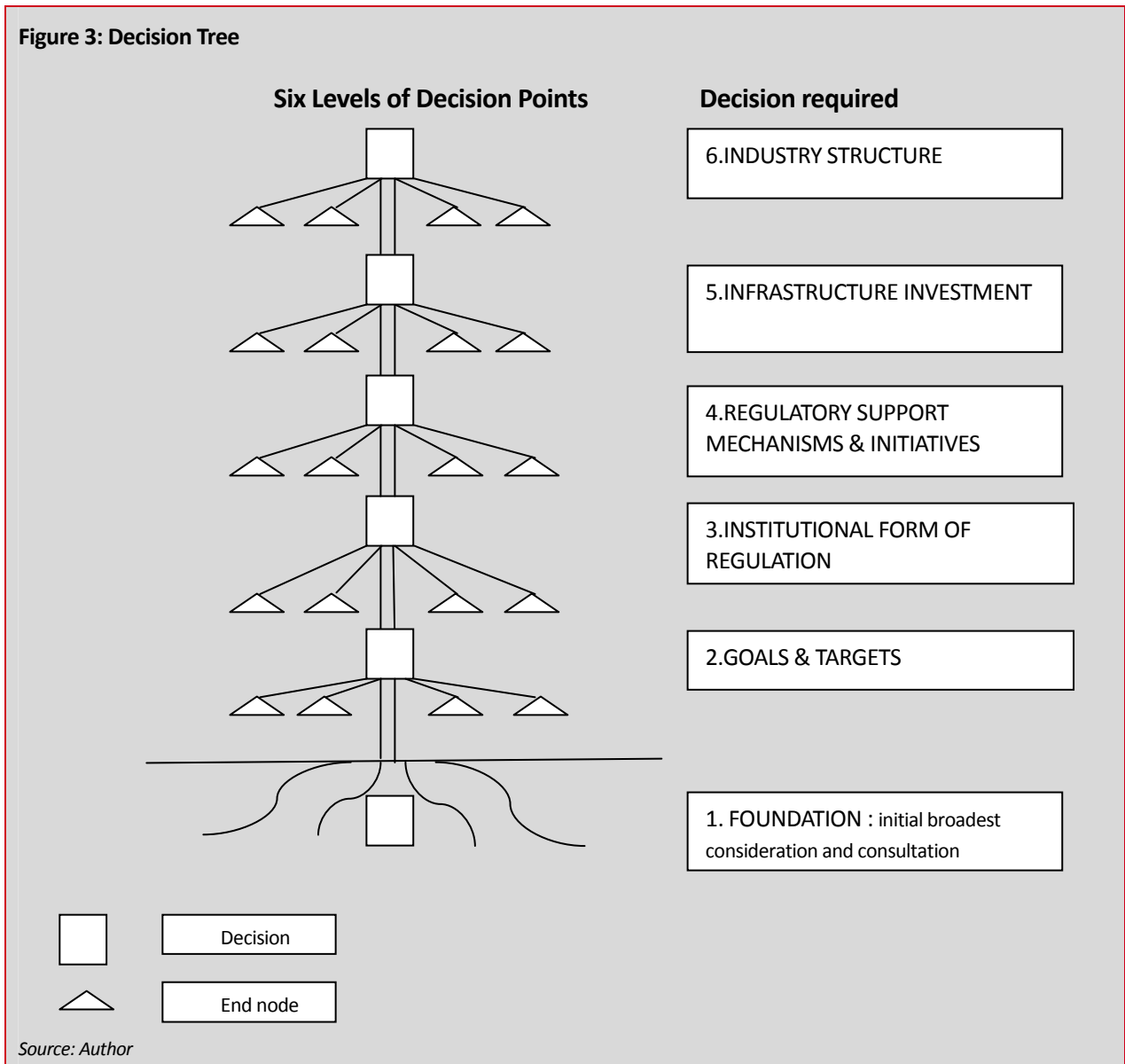
The squares thus represent the focus of a fundamental decision to be made. The triangles provide the set of options or solutions that are available to the decision maker. The circles usually sit between the squares and the triangles and they introduce a probability (where appropriate) to assist decision making further.

In applying this concept to the creation of a National Broadband Plan, the decision-making process surrounding the formulation of the Plan can be captured by six levels of decision nodes. This is shown in Figure 3, which sets out the tree. The Decision Tree shown is the simplest form possible and does not contain chance nodes.

The Decision Tree is left in this simple form for two reasons. Firstly, the subjective probabilities associated

with any chance node will vary from country to country and are influenced by many variables. Therefore the decision to be made amongst the options available is left to national consideration without any undue influence by decisions already made in other countries.

Secondly, whilst chance weightings could be introduced based on, say, the numbers of countries deciding on particular options, this may not lead to best practice, but only to an indication of herd mentality.



The levels of decision nodes to be addressed are:

1. **Foundation:** the initial consideration and consultation that informs and engages broad stakeholder involvement in creating the broadband vision of the future.
2. **Goals and targets:** These should not be set lightly or slavishly. They can appear deceptively simple, but to be set properly they require comprehensive understanding and application of several dimensions, together with an appropriate definition of “Broadband”.
3. **Institutional form of regulation:** This relates to the form of the regulator and its responsibilities. For example, should the regulator be independent, converged, integrated (dealing also with service pricing and consumer issues), or industry specific?
4. **Regulatory support mechanisms and initiatives:** These are relevant to enabling the best and most practicable solutions for a particular country in order to successfully achieve the vision and outcomes. The culture and attitude of the regulator are important.
5. **Infrastructure Investment:** Measures to assist and to encourage industry and service development, e.g., direct investment by government, private industry investment, and public-private partnership schemes.
6. **Industry Structure:** The conceptual approach to the ultimate industry structure needed or that which is already achieved and which best serves the needs of the National Broadband Plan.

In ascending the tree, there need not be strict adherence to the numerical sequence of decision nodes. Indeed, many countries have followed a varying sequence. However, Levels 1 and 2 would be the most efficient and logical starting points, as well as the lowest risk for creating a well-informed national plan.

Whilst the end nodes depicted on the diagram represent the nominal range of options available to a country at the decision point level, there can in some cases be a combination of options. At each level there is the experience of at least several countries to consider for formative thinking.

Examples of the options faced by national decision-makers at each level of the Decision Tree are given later.

1.4.2 An Appropriate Definition of “Broadband”

A critical consideration in the development of a Broadband Plan is an appropriate definition of “Broadband” for Level 2, which in turn will influence the assessments undertaken at Level 1. Even the leading developed countries would benefit from a review of their understanding of the definition.

In earlier days, broadband was characterised by two attributes: “speed” and “always on”. This distinguished it from its predecessor, the dial-up service to the Internet. This dial-up service, though, had the virtue of bringing the user experience into consideration.

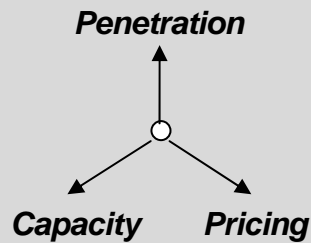
Most current approaches to defining broadband continue to use measurable capacity and speed as key characteristics, together with penetration. This is incorporated into goals and targets within broadband plans. In addition, dual track objectives are often set, for instance in many European plans. These dual track objectives focus on first generation broadband technologies for universal access goals, while positing next generation solutions with higher speeds for a more limited geography or demography.

These current approaches, however, tend to have lost the sensitivity of the user experience.

In approaching best practices (see Figure 4), it is preferable for broadband plans to include intended outcomes of lasting effects and benefits to users and the experience they enjoy. Therefore, a set of attributes which includes penetration, capacity (but *real* delivered speeds), and pricing comes much closer to the desirable user outcomes, and thus generates a definition of broadband that has greater utility. These attributes should provide a better measure of success in the implementation of broadband and point to those countries that should be regarded as exemplary.

Using this approach to the definition of Broadband, a report from Berkman²² shows that the US has actually slipped to middle ranking in the OECD countries in terms of success in achieving broadband implementation. Similarly, Canada – often thought of as a high achiever based on penetration per 100 inhabitants – shows up as a less successful performer.

Figure 4: Broadband Attributes



Source: Author

A variant to the attribute of *speed* in the articulation of the goals of broadband implementation is that of *anticipated applications*. An example is the Republic of Korea's 839²³ program, where the term "ubiquity" is used to describe goals using various technology growth engines.

These comments provide the context for the choices in Level 2, as illustrated in Figure 5, below. There is a growing awareness that best practice tends towards the right hand side of the diagram.

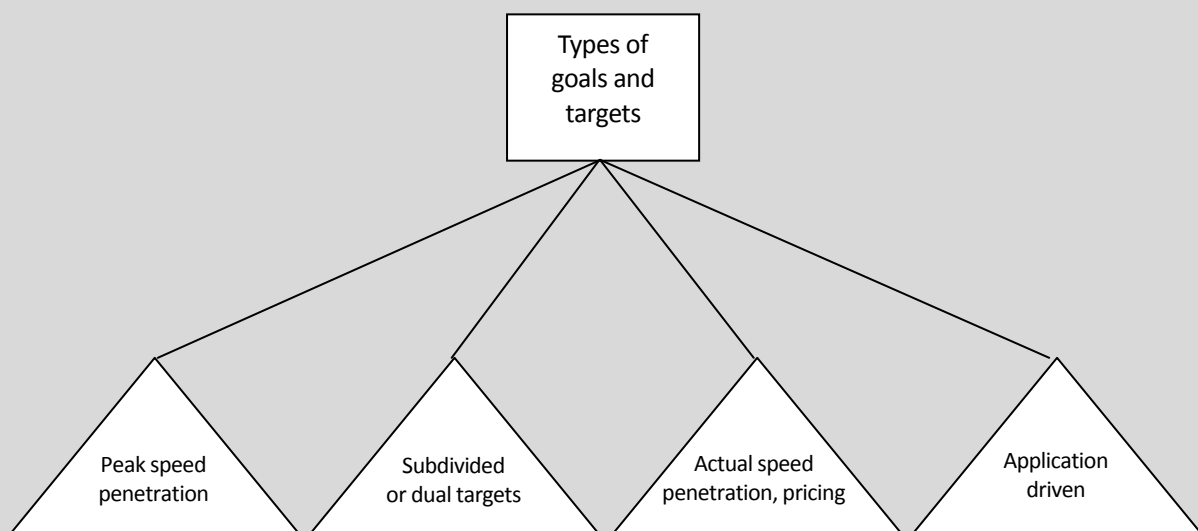
Trying to define next generation broadband access in terms of technology has its difficulties, though many countries do this. For example, they may focus on the singular deployment penetration of fibre-to-the-home (FTTH). On the other hand, there is a widely held belief

that government planning should be technology neutral.

Some argue that hybrid fibre coaxial and fibre-to-the-cabinet or fibre-to-the-curb (FTTC) solutions (which cost roughly one-fifth of FTTH) are middle-mile temporary solutions on the way to a full fibre infrastructure. Others see cable systems as the long term basis for inter-platform competition. See Figure 6

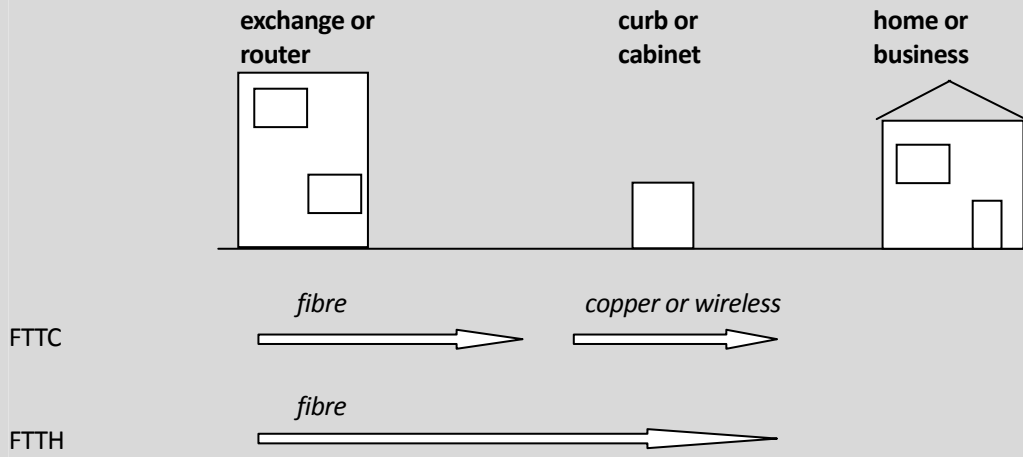
Furthermore, wireless technologies are set to provide significant competition for broadband access together with applications that exploit the nimbleness of wireless. For example, applications that manage information through RFID and IPv6 addressing allow people to connect wirelessly in ways that other technologies cannot.

Figure 5: Goals and Targets Level 2



Source: Author

Figure 6: Fibre Access Configurations

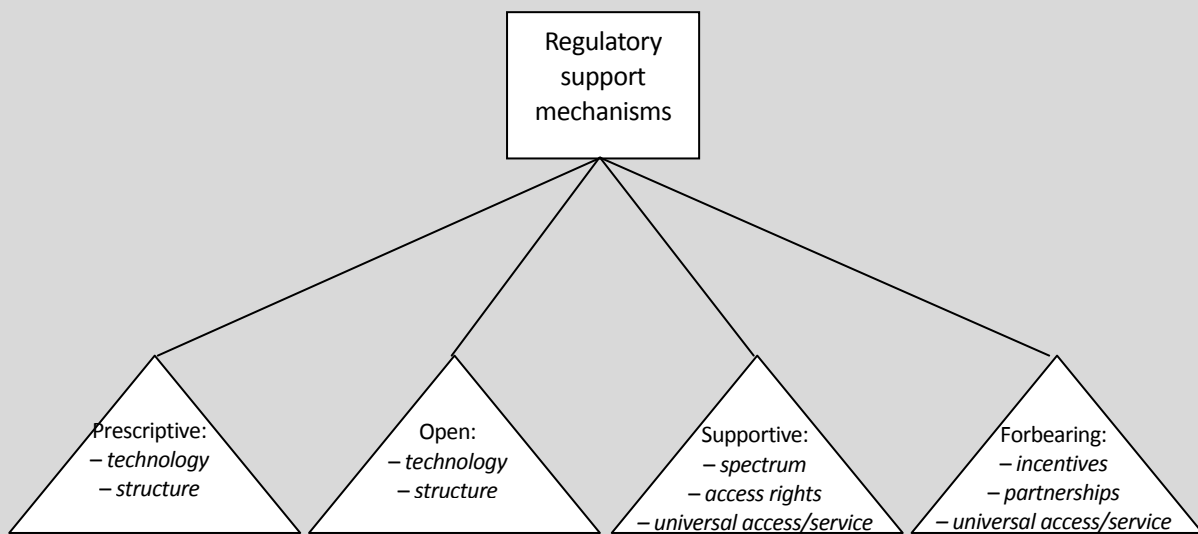


Source: Author

There is thus high risk in tying a definition of broadband to a specific technology since ubiquity and future applications need a more flexible environment. In Figure 7, this would lead to best practice being the safest practice of an open approach to technology and structure with some relevant degree of regulatory support and forbearance. There are quite significant differences in these latter two matters between developed and developing countries.

Developing countries will most probably rely much more heavily on future mobile and wireless technologies and a lateral approach to regulatory forbearance. Fiji, for example, demonstrates sensitivity to the interplay between penetration and pricing in its legislation for its new regulator.²⁴ This legislation provides the regulator with a variety of tools for creating regulatory incentives in access and interconnection in order to catalyse penetration and the reach of future broadband applications.

Figure 7: Regulatory Support Level 4



Source: Author

1.4.3 Comments on Access and Connectivity

“Open access” network policies – unbundling, bit stream access, collocation, wholesaling, and/or functional separation – have played an important role in first generation broadband developments.

However, open access for broadband has not been implemented in some jurisdictions. For instance, in the US, it has been argued in the case of broadband infrastructure that forcing incumbents to lease their networks to competitors would undermine the incentive to invest, and that without that investment, the desired outcomes will not materialize. For other very valid reasons, this argument might also apply to developing countries where such regulatory forbearance may encourage or incentivize investment.

On the other hand, the majority of developed countries and developing countries require capacity to be shared through leasing with competitors, who then focus on their own investments and innovations that use that infrastructure. The theory is that more competitive markets will emerge in this way, delivering higher capacity, at lower prices to more of the population.

Evidence from the Berkman²⁵ study supports this outcome. This evidence demonstrates that developed countries with such an open access approach experience more favourable pricing and capacity outcomes. The Berkman study thus supports an open access approach.

Wireless policies for the next generation of broadband user experience and the advent of ubiquitous and seamless connectivity are also significant. According to the Berkman study, permitting vertical integration, coupled with open access policies and connectivity, has placed Japan and the Republic of Korea half a generation ahead of the rest of the broadband world.

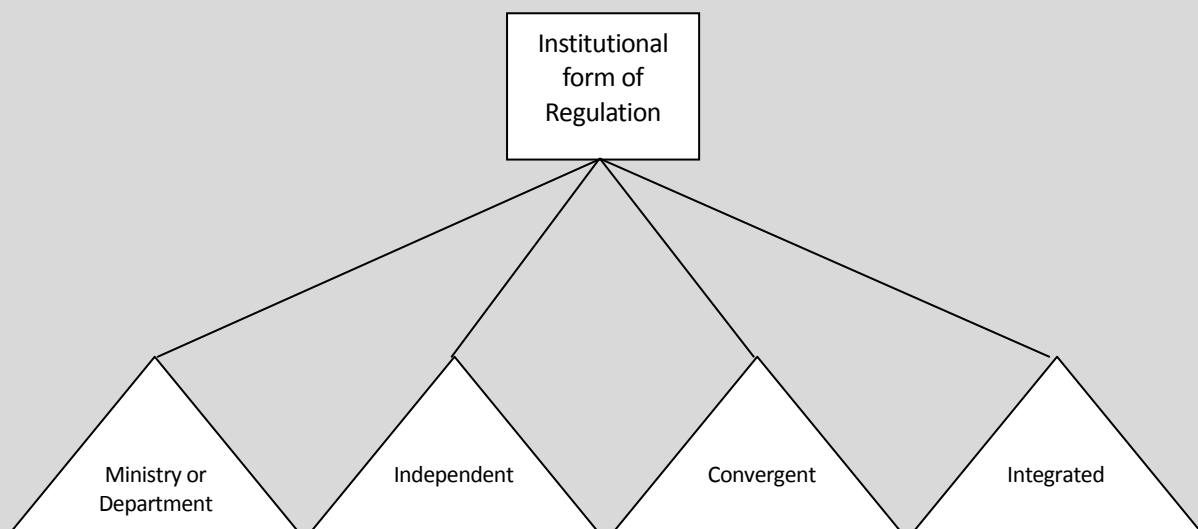
1.4.4 The Institutional Form of Regulation

An important consideration at Level 3 (Figure 8) is the type of regulator responsible for the sector. The regulator must be competent and compatible with the future broadband world.

The past two decades has seen a very noticeable trend around the world towards the establishment of regulators that are separate from the government and Ministry and independent in their decision making. From only 13 such regulators in 1990, their number has grown to 158 at the end of 2010.

A sub-theme of the creation of independent regulators has been a trend towards converged regulatory bodies and also towards integrated regulatory bodies. A converged regulatory body is one that has responsibility for telecommunications, radiocommunications, and broadcasting in a converged world, whilst an integrated regulatory body is one that has responsibility for the regulation of pricing and consumer issues.

Figure 8: Regulation Level 3



Source: Author

The questions remain as to which regulatory model is the most appropriate and whether the necessary control and oversight over vertically integrated operators with market power can be achieved by a horizontal structure of plural regulators. Either way, the answer is not to change the structure of industry in order to fit regulatory structure but rather to find a regulatory structure that can facilitate the smooth operation of the market and ensure varied, advanced and affordable services to consumers.

Where converged or integrated regulation already exists, such as in the UK, the US, and Hong Kong China, the current attitude is to retain that formulation. Other countries seem to be trending towards integrated regulation, especially given the large investments at stake in future broadband developments where small errors from less coherent and knowledgeable regulatory bodies will be magnified enormously. This trend is evident even in developing countries. In Viet Nam, for instance, a semi-integrated regulatory body was created, whilst Papua New Guinea has recently set up a fully integrated regulatory body. Thus, the best practice in this area appears to lean toward the creation of converged and integrated regulators in order to ensure that the regulatory authority is competent to manage a complex industry featuring very significant investments.

1.4.5 Infrastructure investment

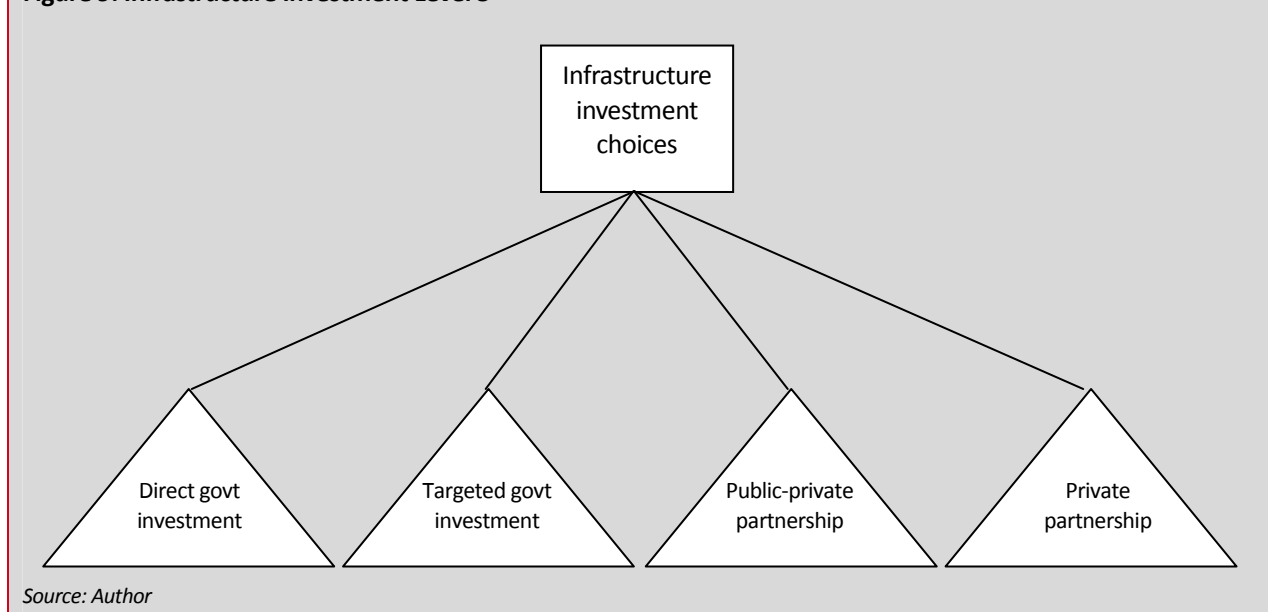
With regard to infrastructure investment, there is a range of options and combinations of options (see Figure 9).

Direct government investment in a wholly owned access platform may be a temporary measure adopted in response to a unique set of circumstances, such as in the case of Australia. Ultimately, the government stake in the platform may be privatized and the enterprise turned over to market mechanisms. This route, however, would not suit most developing countries because of the drain on public funds.

Some form of targeted public investment seems appropriate in most countries, with public funding finding its way into areas that would be underserved or unserved without government intervention. There are also very notable direct investment approaches in some developing countries such as Brazil²⁶. Some governments offer regulatory dispensations to network operators as their contribution to the costs of network provision. Both of these relationships can be structured through public-private partnership agreements.

Other countries are in the fortunate position of being able to rely completely on private investment. Nevertheless, there still appears to be a periodic need for some form of relief or subsidy from government in the face of market failure.

Figure 9: Infrastructure Investment Level 5



On balance, best practice appears to be some formulation of public-private partnership approach.

1.4.6 Industry Structure

The industry structure that emerges from the National Broadband Plan depends very much on the previous Levels (1-5) of decision making. For developing countries, it may not be possible to realize a broad suite of open network competitive platforms in reality. However, some degree of competition in all platforms is advisable even if it is through an oligopoly. Service competition can be promoted in order to minimize total infrastructure costs.

In developed countries, the fundamental belief that competition brings the greatest benefits has guided regulatory best practice for the past two decades. This belief automatically carries forward to a broadband environment where best practice is to promote inter-platform competition and service competition delivered on those platforms. It is also the safest regulatory policy decision to make.

1.4.7 Foundation Level

Whilst the Foundation Level in Figure 11 (Level 1) is the starting point, it reflects the attitude to the higher levels of decision making in the Decision Tree.

The broadest canvass of consultation at the outset of the process offers the greatest prospects for the

ultimate success of the Plan. Thus, consultation needs to go beyond the Ministry involved with communications to include other Ministries. This broad approach to consultation reflects the wide influence and pervasiveness of broadband communications in the future.

Industry should be closely consulted and given the opportunity to provide input to government decision-making. Likewise, the public – comprising users and potential consumers – need to be given the opportunity to convey their views and engaged in a learning exercise that will convey the scale of opportunities ahead. The Plan needs to be marketed and sold as a national, inclusive venture.

The Plan should also provide for skill acquisition and training, especially in developing countries. Addressing infrastructure solutions, penetration and access is not sufficient. Competence in using that access to advantage at the local level is an equally challenging part of the Plan that must be clearly laid out. Treated with the right approach, broadband implementation has the ability to fundamentally change people’s lives for the better.

The Plan is as much a social contract as a plan of action to develop the industry base. It can be understood as bringing about a stronger foundation for a desirable social and economic future built on the three pillars of effective government, private investment and more active citizenship.

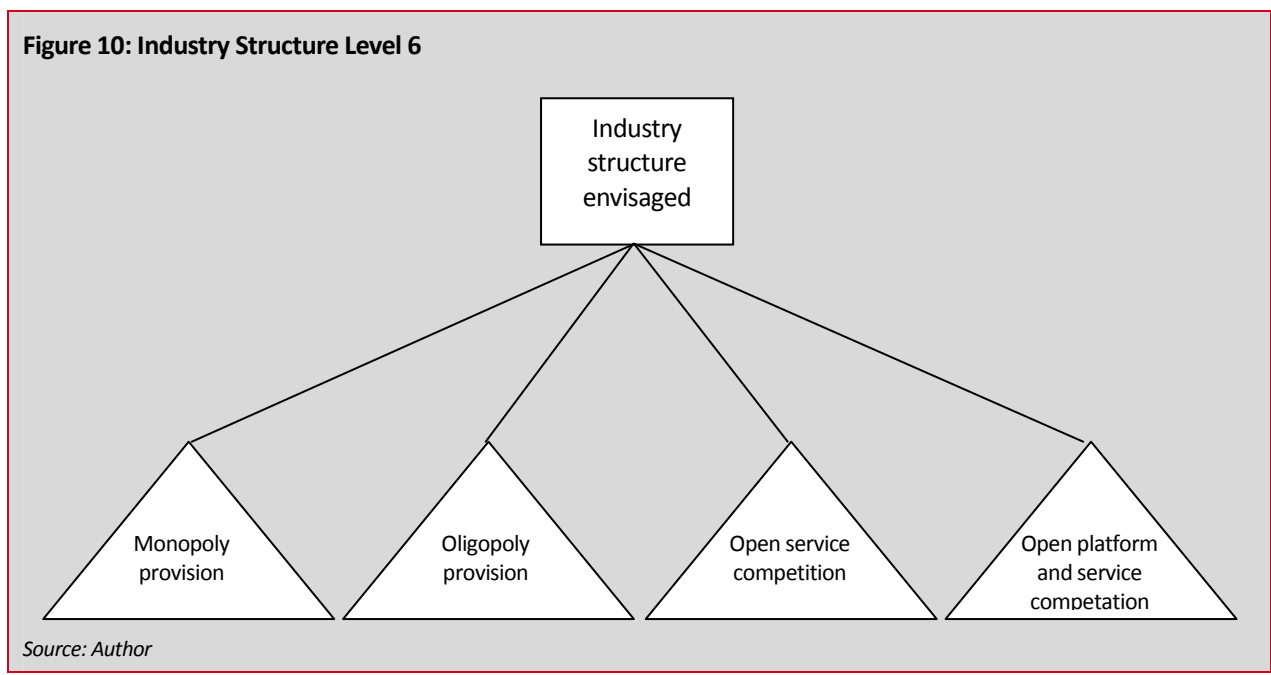
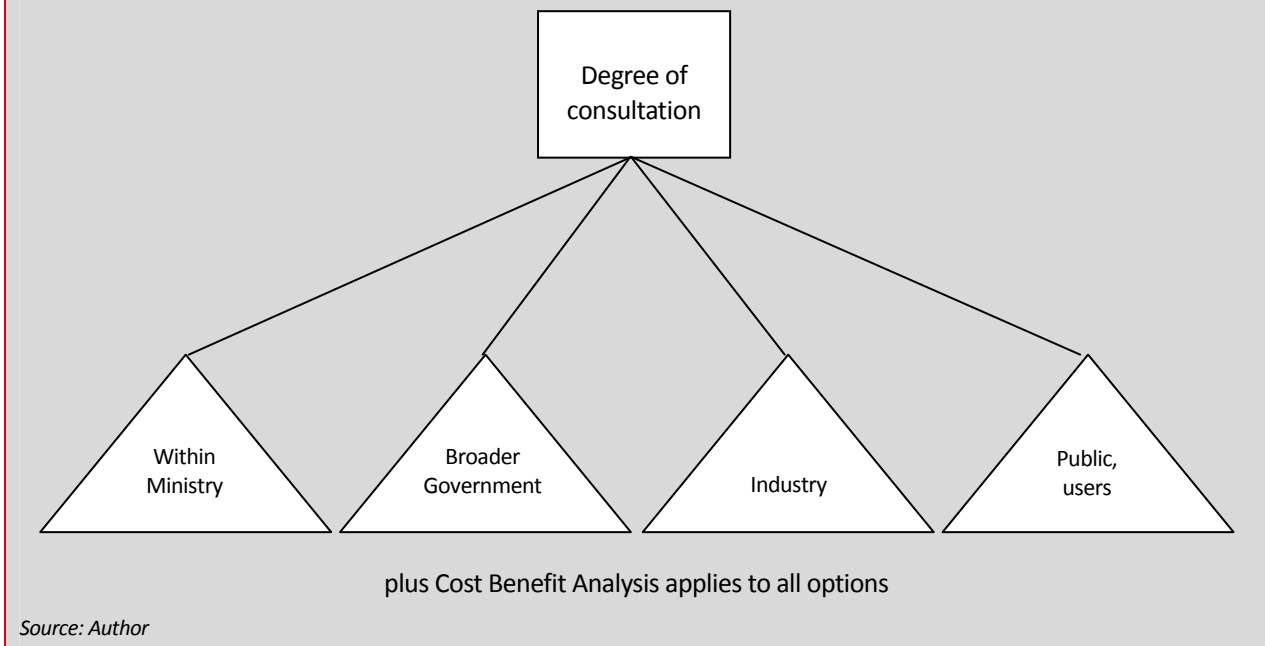


Figure 11: Foundation Level 1



The Plan itself should be subject to a cost-benefit analysis to test the value of the prescription proposed. Government policies, after all, are there to serve the public interest. A policy serves the public interest only if it delivers benefits that exceed the costs, compared with net benefits delivered by any alternative policy.

A social and economic cost-benefit analysis is also an example of responsible government. In his GSR10 paper, Dr Katz²⁷ addresses the impact of broadband and suggests that an investment gap analysis should be performed whenever possible. Exposing such an analysis to broad public scrutiny has a number of benefits that can mitigate risk factors. For example, industry would have the time to assess the sensibility of the proposal and to form partnership investment proposals in response to the proposal. Moreover, public scrutiny allows for a better informed public society, a factor that could affect the take-up of service.

1.4.8 Observations on Best Practice – with Comments on Developing Countries

Much has been said about the Digital Divide and the opportunities offered by broadband. To address the economic benefits alone that infrastructure brings for both developed and developing countries is to miss the point that equality lies at the heart of a successful outcome. For this reason, good development practices should build on the strengths, skills, and ideas of people

living in poverty. Broadband therefore extends beyond a technical or business frontier. The extraordinary transformations to date of countries²⁸ such as the Republic of Korea, Taiwan China, Botswana, and Mauritius have been led by states that have ensured health and education for all and that have actively promoted and managed the process of economic growth. In addition, several East Asian countries have embraced the long-term case for equality to prevent social division and to enable a thriving economy. Taiwan China and Viet Nam have combined astonishing growth with high levels of equity. Indonesia and Malaysia have also managed to reduce inequality through government-led redistribution and generation of employment.

The twentieth century delivered very significant progress in health, education, citizen participation, technology and economic growth in much of the world. Yet there is much to be done to achieve the United Nations Millennium Development Goals. The next opportunity is to turn broadband to advantage through well-regarded government planning and implementation. The size of the task is quite staggering, and there is much to learn from others, although approaches adopted in developing countries may need to be different than those adopted in developed countries.

With these considerations in mind and in light of the previous analysis in this paper, it is possible to draw up a summary of global implementation best practices. These practices are presented in Table 2 on a step-by-step basis at each decision level, in accordance with tree structure of decision points.

1.4.9 An Overview of Implementation Progress

Table 3 summarizes the current most notable feature or current focus of the implementation of broadband in many of the countries around the world. This table thus allows for the identification of country examples at each decision level. Because of their lead role in many ways, the Republic of Korea and Japan warrant two entries in Table 3 below.

Table 2: Best Practice Observations

DECISION LEVEL	DEVELOPED COUNTRIES <i>Important considerations</i>	DEVELOPING COUNTRIES <i>Important considerations</i>
6. Industry Structure	Open Inter-platform competition Open service competition	Limited Inter-platform comp. Open SP competition
5. Infrastructure Investment	Public – private partnerships	Public – private partnerships More government non-financial aid in-kind
4. Regulatory Support Mechanisms	Extend beyond primary reliance on fibre-optics. Use of UAS. Spectrum, rights of way.	Greater reliance on radio technologies. Forbearance. Broader use of UAS. Spectrum, rights of way.
3. Institutional Form of Regulation	Independent, converged and/or integrated	Independent, converged and/or probably more integrated
2. Goals and Targets	More sophisticated goals and targets	More sophisticated goals and targets
1. Foundation	Infrastructure planning inclusive of all stakeholders	Infrastructure planning inclusive of all stakeholders, plus augmented by capacity building

Source: Author

Table 3: Current Implementation

DECISION LEVEL	COUNTRIES AND THEIR GREATEST FOCUS
6. Industry Structure	The Republic of Korea, Japan, Germany, The Netherlands, US, UK, Hong Kong China.
5. Infrastructure Investment	Brazil, Australia, New Zealand, India, Canada, Cyprus, Egypt, Greece, Ireland, Indonesia, Norway, Nigeria, Portugal, Russia, Algeria, Uganda, Botswana, Russia
4. Regulatory Support Mechanisms	Fiji, Dominican Rep, France.
3. Institutional Form of Regulation	Papua New Guinea, Viet Nam, Sri Lanka, South Africa.
2. Goals and Targets	EU, Colombia, Afghanistan, Bulgaria, Austria, Belgium, Denmark, Ecuador, Finland, Ghana, Italy, Luxembourg, Lithuania, Malta, Romania, Hungary.
1. Foundation	The Republic of Korea, Japan, Chile, Croatia, Spain, Austria, Czech Rep, Slovak Rep, Estonia, , Latvia, Poland, Slovenia, Taiwan China, Thailand, Samoa, Singapore, Oman, Saudi Arabia, Argentina, Honduras, Kenya, Malawi.

Source: Author

1.5 Mini-Case Studies

The reference materials used to prepare this Discussion Paper are complemented by a number of mini-Case Studies dealing with Fiji, Papua New Guinea, Argentina, Brazil, and Hong Kong China. Each of these Case Studies is fascinating in its own right. The experiences of these countries with broadband implementation and regulation offers valuable insight into the task of broadband rollout and should be of interest to many other countries in similar circumstances.

1.5.1 Case Study 1: Fiji – *The quiet achiever*

The Republic of the Fiji Islands comprises an archipelago of some 322 islands (of which 106 are permanently inhabited) and 522 islets. The two major islands, Viti Levu and Vanua Levu, host 87 per cent of the population of 890,000, and one-third of that population lives in the capital, Suva. Fiji is the second largest of the Southern Pacific island states (which do not include Australia and New Zealand) after Papua New Guinea. Tourism is a major industry.

1.5.1.1 The challenges facing SIDS

In his address to the ITU World Telecommunications Development Conference in Hyderabad in 2010, the Minister for Communications posed some very pertinent questions relevant to most small island developing states (SIDS). These questions included whether island states have the economies of scale to support broadband rollout and whether states that comprise a number of islands, some of which host a very small population, are attractive markets for infrastructure investors. He raised the issue of whether these states have the resources to implement broadband, both in terms of tangible assets and human capital, given that many of the best and brightest individuals in these states have left for greener pastures.

The Minister went on to explain that in the absence of the capacity and skills to cope with these challenges, SIDS were vulnerable to exploitation by unconscionable and well-resourced companies seeking explicit or implicit exclusivities. He nevertheless articulated a belief in the immense benefits provided by the energy, research, business acumen and robustness of the private sector. Yet he saw the need in ICT for equilibrium between the public and private sectors in order to create a future based on responsible and fair partnerships.

1.5.1.2 Setting the Scene for the Future: Structure and Regulatory Change

In 2007, the Government set a policy to remove all exclusivities that existed in the telecommunication sector. In January 2008, an agreement was signed with exclusive licence holders (FINTEL for the international gateway through the Southern Cross cable, Telecom Fiji Limited (TFL) for the local loop, and Vodafone for mobile telephony). As a result of this agreement, the following developments occurred:

- Vodafone exclusivity in the mobile telephony market ended on 1 October 2008. Digicel launched services in Fiji on the same day.
- FINTEL exclusivity over the international gateway ended in July 2009. TFL entered the international gateway market in October 2010.
- TFL exclusivity in the local copper backbone ended in February 2011. New entrants have yet to emerge in this fixed market.

The granting of 15-year open (unified) licences allows operators to provide any service they wish. With an open licence and assistance from the Pacific Financial Inclusion Program and with Government policies aimed at empowering isolated communities that are unbanked, Vodafone became the first company in the South Pacific to launch mobile money services (M-PAiSA) on 18 June 2010. Digicel followed suit on 15 July 2010 with the help of the GSMA through the Mobile Money for the Unbanked Fund.

The underpinning legislation for these structural changes was the Telecommunications Promulgation 2008. This legislation adopted all policy relating to the release of exclusivities and also provided for an independent regulator for the telecommunication sector, the Telecommunications Authority of Fiji (TAF). The TAF has the authority to deal with licensing, technical regulation, spectrum, and consumer concerns. Competition functions remain with the Commerce Commission, although there are provisions for interworking between regulators. Responsibility for the legislation and policy advice remain with the Department of Communications within the Ministry. The CEO of the TAF took up his role in March 2011, and the organization is now taking shape.

With regard to spectrum, the National Regulation of Spectrum Decree 2009 allows for a stocktake and audit of allocated spectrum with a view to ensuring efficient use through re-allocation of allocated but

unused spectrum. This should eradicate spectrum hogging in a newly liberalized telecommunications sector and lay the ground for major change in the information and broadband sector, recognizing the fundamental role which mobile and wireless has in the future.

1.5.1.3 National Broadband Policy

A Draft National Broadband Policy was drawn up in 2010 following public consultations and will lay the foundations for the broadband future of Fiji. It will drive socio-economic developments towards maximum penetration and usage. It intends to involve Government and regulatory subsidies, initiatives, and fiscal policies, and will couple with the implementation of Universal Service Objectives. The policy will involve consumer awareness, consumer protection, infrastructure development and environmental sustainability.

The newly-created TAF is to make an input to the Draft Plan before finalization. In the meantime, the Government has undertaken the creation of regulatory incentives in order to continue the momentum building towards broadband. For example, as of January 1st, 2011, there has been a removal of duties on the importation of mobile broadband dongles to promote accessibility and affordability. Fiscal and excise duties have been removed on computers, computer parts and accessories, specialized plant, equipment and fittings, and specialized furniture for ICT companies to boost business in the ICT sector. There has also been a reduction of import duty on smart-phones, from 32 per cent to five per cent as of January 1st, 2011.

Within telecommunication regulation, there is provision for the regulator to approve interconnection undertakings that reflect a balance between economic orthodoxy and government policy desires for increasing penetration. Other regulatory matters to receive consideration in future include infrastructure sharing and the efficiencies that such sharing would create.

SMS banking has had a huge impact in the Fiji islands, and is seen in a broad context of education in money management and opportunity for entrepreneurship amongst the young especially.

It is therefore clear that the technology pathway to the broadband future is very much influenced by radio,

namely, progressive generations of mobile voice and data evolution (3G, LTE, LTE Advance, Wimax, WiMAN, Satellite), together with spectrum considerations for access and backbone provision. This pathway is also influenced by applications and the reality of needs of the population. In addition, the major industry of tourism has shown a great appetite for mobile communications.

Preparing the nation for a broadband future and the opportunities arising from ICT is a very important aspect of the national Plan. Infrastructure and access alone are insufficient. In terms of the needs of everyday Fijians, community centres will see some re-branding as schools (by day) will become community centres at night where tuition will be available to assist with the use of computer training. The University of the South Pacific (USP) in Suva is very active in this area, with three tiers of programs. The lowest level of program is suited to absolute beginners. Vodafone has established a process of donation of computers to communities. This not only demonstrates good corporate citizenry but also, of course, fuels future demand and is a beneficial good all round.

Fiji has a geographic advantage in relating to other island states in the South Pacific, and sees itself developing as a hub in the information age. A cable spur from the Southern Cross cable to Tonga is under way, and one is anticipated to another major island state, Vanuatu. Satellites play an important role throughout the South Pacific, and the USP makes very effective use of the technology in its educational programs on an international basis.

1.5.1.4 Summary

In brief summary, Fiji has arrived at the broadband take-off point with its regulatory house in order and is ready to take advantage of further infrastructure development through a competitive industry. To extract the most from that future, capacity building is firmly in focus. As at mid-2010, the National Broadband Plan has yet to be finalized. In preparation, the attitude towards technology has been to avoid being overly prescriptive and to recognize the importance of applications that should be targeted and supported for the national good. The involvement of the whole of Government is a key feature of the approach and a support for future broadband.

1.5.2 Case Study 2: Papua New Guinea – *A bountiful land*

As reported by Holmes²⁹, Papua New Guinea (PNG), with an estimated population of 6,732,000 in 2009 and a land area of 463,000 square kilometres, is the largest of the Pacific Island countries. The capital, Port Moresby, has a population of over 250,000 people, and the extent of urbanization is less than elsewhere in the Pacific. Natural resources are an important part of the economy.

Access to telecommunication infrastructure and services in PNG is, despite recent improvements, among the lowest in the world. Currently, teledensity³⁰ is about 16 per cent. Growth in teledensity has been constrained by several factors: a hitherto monopolistic market structure; limited investment and maintenance; high costs; limited access to credit, particularly in rural areas; a dualistic economy (natural resource “enclaves” versus subsistence living); a highly dispersed population (85 per cent rural); and a challenging topography/physical environment.

Access to basic telephony has improved significantly since introduction of competition in mobile telecommunications in October 2007. The regulator, NICTA reports that the number of mobile subscribers has increased to about 1,800,000, bringing mobile teledensity to an estimated 26 per cent as of January 2011, while prices for calls have fallen by 60 per cent.

NICTA also reports that in 2011, Internet penetration (mostly dial-up, at speeds below 9600bit/s in some areas) remains extremely limited: there are only about 15,000 subscribers, primarily in Port Moresby. Ten Internet Service Providers are currently operating. Constraints include Telikom’s wholesale monopoly (Tiare gateway) and the availability and cost of electricity and computers. Deployment of broadband is minimal and costs high relative to countries with similar incomes; other than WiFi at the access level, broadband wireless services are in the very early stages of development. Public access facilities, both to telephony (e.g. “village phones”) and the Internet (e.g., public kiosks/telecentres), are very limited.

1.5.2.1 The Enigma that is Papua New Guinea

Papua New Guinea ranks last among the Asian Development Bank’s Pacific member countries on the UN index of human development and human poverty, and is struggling to meet the UN Millennium

Development Goals. Yet there is a silver lining emanating from the resources sector.

In 2010, the go ahead was given for a USD15 billion liquefied natural gas development by Exxon Mobil.³¹ First exports are scheduled for 2014, and the project has the potential to lift the GDP (almost USD8 billion in 2009) by up to 50 per cent. This project is complemented by other unrelated resource projects that are either in prospect or under way. However, one very important spin-off is a backbone fibre infrastructure project along the pipeline route (see below).

Given the appropriate application, the resources sector could be the catalyst for immense changes in PNG brought about by public/private development and to be of benefit to the broader fields of health, education, human capacity, business and social development. These are the prospects that excite many people involved with PNG.

1.5.2.2 National ICT Policy

ICT has a fundamental role to play in the social and commercial future of Papua New Guinea. The Government’s recently implemented National ICT Policy and the emergence of a new ICT regulatory body in October 2010 are designed to encourage commercial investment and competitive activity in the ICT sector in order to promote broader social and economic benefits in PNG. A key objective is that:

*Papua New Guinea must have an efficient ICT infrastructure as the backbone of ICT policy with the use of technology appropriate to the circumstances of PNG. This will require substantial investment to refurbish the existing network, extend its availability across the country, allow new networks to develop and increase technical capabilities to support high-speed broadband.*³²

In accordance with the National ICT Policy, substantial changes have recently been made to the legal framework and institutional structures that regulate the ICT sector. A new National Information and Communications Technology Act (the Act) incorporating these reforms was approved by Parliament in November 2009. These reforms include the establishment of a new sector regulator, the National Information and Communication Technology Authority (NICTA), with regulatory responsibility for the ICT industry.

NICTA is a fully integrated, independent regulator with responsibility for licensing, technical regulation, competition regulation (a function merged from the Independent Competition and Consumer Commission), consumer regulation, and spectrum regulation. NICTA took up its remit in October 2010, and its Board met for the first time in March 2011.

NICTA's formative challenges are to create the appropriate and responsive organization structure and to acquire and develop the capacity and skills to successfully manage the regulatory tasks at hand.

The Act also introduced a Universal Access Scheme in PNG that provides for the establishment of a Universal Service Fund (USAF) that replicates successful experiences in other developing countries. The Fund will finance competitive, one-time capital subsidies to create incentives for operators to cover commercially unattractive areas. The National ICT Policy acknowledges that despite the "community service" obligations of licensed mobile operators to provide service in 229 communities, a significant access gap is likely to persist in PNG due to the operational constraints noted below. To address this, the Policy established a more wide-ranging incentive program in line with international best practices: the Universal Access Scheme that has more ambitious targets including always-on broadband access and voice access outside the mandatory rollout areas.

1.5.2.3 Industry Structure

The telecommunication market is presently served by Telikom PNG Limited (Telikom), the incumbent general carrier, which is licensed to provide national fixed and international services. There is competition in the public mobile services market between BeMobile and Digicel PNG Limited (Digicel) using GSM at 900 MHz and 1800 MHz. In addition, Telikom has commenced a CDMA network, initially for fixed wireless access in Port Moresby, and is currently testing mobile functionalities. There are approximately ten licensees in the value added services market.

On a broader canvass, the Independent Public Business Corporation (IPBC) is a statutory corporation that holds a number of State-owned enterprises (SOEs) for the Independent State of Papua New Guinea (the State). One such SOE is Telikom, which previously held a monopoly over fixed and mobile telecommunications services in PNG.

Key issues and recent developments concerning Telikom include the following:

- (a) Prior to 2007, corporatization reforms were undertaken in order to improve Telikom's ability to participate and perform in the prevailing commercial context.
- (b) In 2007, competition was introduced to the mobile telecommunication market. This ended Telikom's monopoly in mobile telecommunications.
- (c) At the end of 2008, Telikom's mobile telephony operations were separated from its remaining operations and partially privatized as BeMobile. Telikom remains a shareholder of BeMobile, owning a 50 per cent stake in the company.
- (d) Telikom has accumulated 370,000 subscribers overall and 80,000 fixed line subscribers. However, Telikom's fixed line and data infrastructures are aged and inflexible, and require significant investment. In addition, Telikom's workforce is not well-equipped for the deployment of new technology.
- (e) Telikom faces a number of challenges, including:
 - limited capacity in major trunk routes;
 - operational difficulties due to geographic and management limitations;
 - below-standard levels of service quality and reliability, partly because of the aged network infrastructure;
 - extensive bypass by licensed and in some cases currently unlicensed VSAT operators;
 - an under-developed wholesale business model;
 - serious under-utilisation of certain assets, particularly international cables;
 - high prices for bandwidth; and
 - some duplication of infrastructure in the deployment of microwave capacity by other major operators.

1.5.2.4 The Outlook for Broadband

The PNG National Executive Council (NEC) has directed the Minister for Public Enterprises, responsible for the IPBC and Telikom, to:

- liaise with both the Minister for National Planning and the Minister for Communications and their respective departments, to formulate an

appropriate telecommunication Broadband Policy to complement the National ICT policy; and

- commission a detailed Broadband Implementation Study³³ for the ownership and operation of broadband backbone assets in PNG, including future network rollout, in collaboration with the Minister for National Planning and the Minister for Communication and their respective departments; and
- report to the NEC on the conclusions and recommendations of the Broadband Implementation Study.

These initiatives aim to:

- significantly increase the capacity and coverage of the domestic backbone or backhaul transmission infrastructure;
- significantly increase utilization of international capacity; and
- promote the creation of an efficient wholesale market.

Additionally, NICTA has reformed the spectrum in the 900 MHz band and has reassigned this spectrum to existing mobile operators in a way that will provide for additional wireless broadband services within the spectrum available in this band.

1.5.2.5 PNG LNG Fibre and National Broadband Project

In order to advance the development of national broadband capability, as well as to restructure and revitalize Telikom's business, the State (through the IPBC) has agreed to acquire certain rights in respect of 50 per cent of the capacity of an optical fibre link. This link is to be constructed in connection with the PNG LNG project (the PNG LNG fibre cable). The agreement formalizing these arrangements was executed in late January 2011. The PNG LNG fibre cable link will be laid over 750km from the Hides gas field to the LNG plant near Port Moresby.

The IPBC considers that investment in the PNG LNG fibre cable link should be part of a nationwide high-capacity backbone network. This network should seek to:

- improve PNG's national telecommunication infrastructure, including the development of capabilities to support high-speed broadband, and

- ensure that valuable state ICT assets are held by PNG entities capable of efficiently using and developing those assets.

1.5.2.6 Summary

In summary, PNG is poised to create a broadly considered Plan for broadband implementation. This Plan will rely on assistance from its resource wealth for funding and should create lasting benefits that will be widespread throughout the economy and society. Regulatory solutions are in place, and these are open to competitive infrastructures being created without undue restraints on technology.

1.5.3 Case Study 3: Argentina – Showing the way with preparations

Argentina is Latin America's third largest economy with a high rating on the human development index. Analysts point to the country's foundation for future growth due to its market size, levels of foreign investment, and percentage of high-tech exports as a share of total manufactured goods. Broadband is therefore particularly important to the future.

1.5.3.1 Developments in Broadband

Argentina sets an excellent example of thorough and well-consulted preparations in developing a National Plan, *Argentina Conectada*³⁴ (Argentina Connected). This Plan has elements that should appeal to both developed and developing countries.

In October 2010, the Government of Argentina, recognizing the importance of broadband for social and economic development, launched a major initiative to increase broadband connectivity for individuals, businesses, educational institutions and government offices across the nation. The initiative is built upon the premise that the development of broadband requires not only the availability of basic data transport infrastructure and affordable connectivity services, but also appropriate applications and content, a large installed base of terminal equipment, and the expansion of ICT skills among citizens of Argentina.

An integrated public policy approach to the design and implementation of a national telecommunication plan is thus required to promote such a complex ecosystem. The National Plan was released in October 2010, and combines under a single connectivity initiative several other efforts already under way. In

particular, it integrates ongoing programs aimed at digitalizing terrestrial broadcasting, providing ICT equipment and training to public-school students, extending connectivity to remote areas, and establishing public access ICT centres, among other programs.

The Plan is guided by the following strategic guidelines:

- Digital inclusion for all citizens and universal broadband connectivity across the Argentine territory;
- Optimization of spectrum use;
- The promotion of local content and employment in the ICT sector;
- The development of next-generation telecommunication infrastructure;
- The promotion of local R&D; and
- The strengthening of competition in telecommunication services.

1.5.3.2 Where Argentina stands today

Argentina has a long tradition of well-developed public utilities such as water, electricity and telecommunication services. It ranks high within Latin America in broadband adoption. In September 2010, *Argentina Conectada* reported that the number of residential broadband connections reached 4.5 million people (an increase of 30 per cent from the previous year) in a population of some 40 million. About a third of households are already connected.

While this sustained growth suggests the presence of a competitive market environment, a closer examination reveals several challenges that result from well-understood market failures in the provision of broadband services. Among them are:

- The large regional disparities in broadband penetration, which reduce development opportunities for the poorest regions;
- The limited capillary presence of the backbone infrastructure for data transport, which results in high prices and low service quality outside the main urban centres;
- The limited connectivity among public schools, libraries, and government offices;

- The inadequate skills and low penetration of terminal equipment among disadvantaged households, which reduces demand incentives; and
- The limited development of local content and appropriate electronic services, which also reduces broadband demand.

In summary, despite the rapid development of broadband in Argentina over recent years, the government has a key role to play to ensure:

- a) balanced growth of the broadband ecosystem and
- b) wide distribution of the benefits of such growth across regions and social groups. In particular, the State has an important role in:
 - orienting private investments to ensure wide regional coverage of advanced services;
 - making complementary public investments in basic transport infrastructure to promote competition in non-replicable network segments;
 - promoting service affordability and appropriate service quality benchmarks; and
 - stimulating broadband demand through complementary investments in digital literacy, content and applications, research and development, and public access centres.

1.5.3.3 Key Initiatives

The table below presents the key initiatives articulated under *Argentina Conectada* for each of the components of the broadband ecosystem. At the centre of the government's strategy is the creation of a national fibre-optic network backbone operated by AR-SAT (Empresa Argentina de Soluciones Satelitales S.A.), a government-owned corporation with extensive experience in telecommunication services.

AR-SAT will fulfil connectivity demands in the public sector and operate under open network principles in the wholesale data transport market. This strategy is complemented with financial stimulus to local operators in the last-mile segment, as well as the establishment of public access centres across the nation. The goal is to double the available fibre-optic backbone infrastructure and the number of broadband subscriptions within a five-year period (2011-2015).

Table 4: Argentina Conectada: Key initiatives

<i>Component</i>	<i>Current Situation</i>	<i>Initiatives</i>
<i>Data transport infrastructure</i>	Low capillarity, few data exchange points for local traffic.	Deployment of federal fiber optic network and NAPs at provincial level through AR-SAT.
<i>Telecommunication services</i>	Incomplete coverage, high cost and low quality in semi-urban and rural areas.	AR-SAT operation in wholesale data transport segment. Public financing to local operators in last-mile segment. Optimization of radio spectrum use to stimulate mobile broadband. Establishment of public access centres in libraries, community centres and selected public spaces.
<i>Terminals and equipment</i>	Regional disparities, limited adoption in public schools and SMEs	Laptops to public-school students (Conectar Igualdad program). Financial stimulus to PC adoption (Plan MI PC2).
<i>Applications and content</i>	Limited availability of educational and e-gov applications, as well as local content.	Financial stimulus to local application and content production. National educational portal. National e-gov plan CIVITAS2
<i>Human capital</i>	Disparities in ICT skills, limited development of higher education in ICT area.	National digital literacy program. Support to ICT-related higher education. Financial stimulus to R&D in ICT sector. Creation of National Telecommunications Institute.

1.5.3.4 Execution Strategy

Argentina Conectada was the product of several months of collaboration among multiple government agencies and extensive consultations with the private sector, academia and other civil society organizations. This multi-stakeholder approach is reflected in its execution strategy.

Under the leadership of the Ministry of Federal Planning, Public Investment and Services, the Planning and Strategic Coordination Commission will be responsible for the overall execution of *Argentina Conectada*. In this regard, the Planning and Strategic Coordination Commission will articulate the efforts of several thematic working groups in which multiple government and non-governmental actors participate. The regulator plays a key role in the activity.

These Working Groups are as follows:

- Digital Inclusion;
- Spectrum Optimisation;
- Universal Service;
- National Production and Employment;
- ICT Capacity Building and Research;
- Connectivity and Infrastructure; and
- Competition.

1.5.3.5 Summary

In summary, Argentina has a well-developed broadband plan in place that has broad support and involvement of stakeholders. The Plan revolves around the creation of a national backbone fibre-optic network

operated by AR-SAT, a government-owned corporation offering open access at a wholesale level. The strategy is complemented by financial stimuli to local operators over the last mile segment, and the role of the regulator will evolve as the Plan matures into implementation.

1.5.4 Case Study 4: Brazil – *The stirrings of a giant*

Brazil is the largest country in South America, both by geographical area and by its population of over 190 million. The country has extensive natural resources, and the Brazilian economy is the world's eighth largest. The implementation of a broadband plan thus has major significance in global terms.

Broadband is at the core of service and network convergence, and Brazil sees competition as a main driver to increase broadband service offerings over a wider area and population. Competition will allow reduced prices and increased quality of service for the majority of the country and other actions are seen to be needed to make sure that the whole population has access to these services.

Industry has been increasing in Brazil in response to market growth and increased competition. The latest radiofrequency auctions have required significant investment from operators, and this is reflected in the industry's development as well. Optical network infrastructure has been one of the most significant areas of growth. As a government-owned incumbent, Telebrás is being revitalized by an injection of funding to effectively create an additional player in the wholesale market. Consequently, an increase in the industry's growth is expected for the next couple of years. The new responsibilities of Telebrás are dealt with in a separate section below.

Policy and government intervention assist the evolution of broadband. Government supports the implementation of the National Broadband Plan by setting out the goals and responsibilities for actions to be taken. Pursuant to Telebrás' responsibility under the Plan, the government is currently financing the implementation of the network. Regulatory actions are undertaken by Anatel, as explained in a section below.

1.5.4.1 Establishment of a National Broadband Plan

In May 2010, the President issued a Decree establishing the National Broadband Plan.³⁵ The Plan has the objective of fostering and disseminating the use and provision of information and communication technology goods and services in order to:

- enhance access to broadband Internet connection services;
- speed social and economic development;
- promote digital inclusion;
- reduce social and regional inequalities;
- promote the generation of jobs and income;
- expand Electronic Government services and facilitate the use of State services by citizens;
- promote capacity building for the population on the use of information technologies; and
- expand Brazilian technological autonomy and competitiveness.

The Plan is being implemented, managed and monitored through a Digital Inclusion Program Steering Committee that has the following tasks:

- define the actions, goals and priorities of the Plan;
- promote and foster partnerships between public and private entities in order to reach the objectives of the Plan;
- establish the technical definition for broadband access for the Plan;
- monitor and evaluate the actions for the implementation of the Plan; and
- publish annual reports on the actions, goals and results of the PNBL.

The Steering Committee has the following Thematic Groups (and others may be created):

- Telecommunication Infrastructure and Services, coordinated by the Communications Ministry;
- Applications, coordinated by the Planning, Budgeting and Management Ministry; and
- Content, coordinated jointly by the Culture and Education Ministries.

Consultation about the broadband plan has been widespread and has taken place through forums open to the public and meetings of the Steering Committee. Consultation focuses on building a general consensus about the country's broadband needs and the appropriate specific targets and goals.

In terms of a cost-benefit analysis of broadband implementation, there has been an analysis to evaluate the sustainability of specific broadband offers in the country (coverage versus retail price, etc.). One of the major objectives of the Plan is to promote competition in the wholesale market in order to reduce prices for end users as a result of economic market forces.

In setting tangible targets for the program, an Action Plan has specific goals. Some are in an initial formulation phase, others are in a discussion phase and others are already under implementation. All these actions are listed on the Plan's website.³⁶ In general, infrastructure and service regulation, financial and taxation incentives, national production policies, content and applications are the main areas for the actions.

1.5.4.2 Responsibilities of Telebrás

To achieve the objectives of the Decree, it is Telebrás' responsibilities to:

- (a) implement the private communication network of the federal public administration;
- (b) provide aid and support to implementing public policies on Internet broadband connections to universities, research centres, schools, hospitals, service stations, community telecentres and other locations of public interest;
- (c) provide supporting network infrastructure to telecommunication services provided by private companies, States, Federal District, Municipalities and nonprofit entities; and
- (d) provide broadband Internet connection services to end users, only on those localities that do not have adequate service offering.

Telebrás will fulfill its activities according to current legislation and regulation, subject to applicable obligations, duties and conditions.

The information and communication technology systems provided in items (a) and (b) above are considered strategic for the purposes of hiring of goods

and services related to implementation, maintenance and improvement.

The implementation of the private communication network of the federal public administration provided in (a) above consists of the provision of services, infrastructure and communication supporting networks and data transmission.

The Steering Committee will define the localities that do not have adequate broadband Internet connection service offering as provided in item (d) above.

In the fulfillment of the objectives of the Plan, Telebrás is authorized to use, operate and maintain the infrastructure and telecommunication services supporting networks under the ownership of the federal public administration.

When dealing with indirect federal public administration entities, including public companies or mixed economy societies, the use of the infrastructure provided above depends on a leasing contract between Telebrás and the providing entity.

1.5.4.3 Responsibilities of ANATEL

The national telecommunication regulatory agency, ANATEL, is responsible for organizing all telecommunication services in Brazil, as well as regulating technical aspects of networks and spectrum usage.

Anatel is to implement and execute the regulation of telecommunication services and network infrastructure for supporting broadband Internet connection, guided by the following directives:

- foster competition and free initiative;
- stimulate innovative business models that advance in the use of convergent services;
- adopt fast procedures for conflict resolution;
- impose obligations for the sharing of infrastructure;
- ensure management of public goods and infrastructure, including radiofrequencies, in order to reduce the costs for the broadband Internet connection service; and
- increase broadband Internet connection service offering in the installation of telecommunications\ infrastructure.

Anatel must observe the policies established by the Communications Ministry.

Anatel has no influence on the choice of technology to implement broadband. In Brazil, regulation is neutral with respect to the technology to be employed in any network. In the context of the National Broadband Plan, where Telebrás has a significant role to play, it is up to that company to decide the technology to be implemented for its own network.

Telebrás is in the process of contracting with vendors and suppliers to build its network. Its timeline is to initiate service in 2011. It is understood that the first stages consist of a hybrid optical network with microwave links to provide wholesale backhaul and backbone. As at mid-2011, this is still a work-in-progress.

There are various regulatory obligations and incentives related to broadband rollout. Examples include: obligations tied to spectrum licences to offer services in a wider range of municipalities; a proposed regulation to promote competition in several relevant markets (where broadband is considered as wholesale), taking into account Significant Market Power; and other proposed regulations to reshape network termination rates and to address service provision and. These latter proposed regulations may contain incentives.

Summary

In summary, Brazil has a well-developed Plan and implementation framework. A key element is the government-owned incumbent, Telebrás, and its revitalization through an injection of funding to effectively create an additional player in the wholesale market. The role of the regulator ANATEL is also well specified.

1.5.5 Case Study 5: Hong Kong China – *Some valuable pointers*

Hong Kong China offers the chance to fast-forward to a high density, high penetration laboratory with sufficient autonomy in order to gain some valuable insight relating to broadband as it rolls out throughout the world.

Hong Kong China is one of two special administrative regions of the People's Republic of China. With an area of 1104 square kilometres and a

population of 7 million, it is one of the most densely populated areas in the world. Under the principle of "one country, two systems", Hong Kong China has a different political system from mainland China, with an independent judiciary operating under a common law framework. The Basic Law of Hong Kong China stipulates that Hong Kong shall have a "high degree of autonomy" in all matters except foreign relations and military defence, and it governs its political system.

As one of the world's leading international financial centres, Hong Kong China has a major service economy characterized by low taxation and free trade. The lack of physical space triggered demand for denser construction, giving rise to a city that is now noted for its modern architecture and for being the world's "most vertical" city.

Hong Kong China also has a leading telecommunication economy with world-class infrastructure. Digitalized since 1995, the Special Administrative Region has been wired extensively with optical fibre cables, with the vast majority of households covered by this extensive broadband network. The rollout has been characterized by the utilization of practically every type of technology. Hong Kong China is naturally a key regional telecommunication hub and, as such, is the landing point for a significant number of strategically important submarine cables. Television is a substantial market in the economy, with an estimated customer base in 2011 of over 2.2 million households (99 per cent).³⁷

1.5.5.1 Policy settings

General guiding principles for the government are simple: "big market, small government" and "market leads, government facilitates". The role of government is to provide a facilitating environment and to intervene only where there are obvious imperfections in market mechanisms.

The same macro-economic policy applies to the telecommunication sector, which has been liberalized since the 1990s, resulting in one of the most competitive markets in the world. The Hong Kong China government has not provided any direct investment or any forms of subsidy in network construction or telecommunication services provision in the region. There has been no need to make up for a reduced level of consumption and investment by the private sector.

Even in the 2009 global financial crisis, this approach has prevailed, despite the soul searching questions at the time about whether Hong Kong China should depart from its proven pro-market policy. Questions were raised about whether regulatory holidays or financial incentives should be offered to the industry, and whether public funding should be injected to stimulate investment in telecommunication infrastructure.

1.5.5.2 The Role of Regulation

The telecommunication regulator, the Office of the Telecommunications Authority (OFTA), is central to implementation of government policy. It has responsibility for the regulation of competition in telecommunications, licensing, technical regulation, spectrum, and consumer matters. It is thus a completely converged and integrated regulator.

In October 2010, at an International Regulators Forum in Barcelona³⁸, the Director General of OFTA laid out some examples of how her organization had dealt with the trying times of the global financial crisis. She noted the following:

(a) At the height of the financial collapse, in January 2009 OFTA proceeded with a spectrum auction to ensure the timely introduction of LTE, WiMAX and other broadband technology in Hong Kong China. The reserve price was left unaltered and the auction left to market forces.

The auction was a success. A total of 90 MHz in the 2.5 GHz band was acquired by three successful bidders at a price of USD197 million. Private investment continued, and a new LTE technology centre and a state of the art laboratory were set up, creating more jobs.

One of the successful bidders announced deployment of the world's first dual-band network in Hong Kong China in early 2011, with another aiming for service launch by mid-2011.

The regulatory action thus paved the way for new business opportunities for applications developers, content providers and on-line advertisers, which will in turn expand the industry and further spur growth of the telecommunication market.

(b) Because of a sufficiently high degree of facilities-based competition, the government does not need to provide funds to finance the development of broadband infrastructure.

During the financial crisis, OFTA raised this matter with industry in a review to determine whether this was indeed the case. The majority of industry representations supported the continuation of a pro-market policy. The consensus was that investment and construction of telecommunication networks should continue to be based on the business plans and commercial decisions of the private sector as this would confer the greatest degree of flexibility required for business operations.

That being said, OFTA has contributed a number of facilitating measures to assist the continuous rollout of broadband networks by industry, including:

- The introduction of a registration scheme for buildings connected by FTTH or Fiber-to-the-Building (FTTB) in order to support public awareness of fibre-based facilities;
- A consultancy study into streamlining the landing of submarine cable systems in Hong Kong China; and
- Facilitating the deployment of mobile broadband services through the timely release of spectrum, and allowing mobile operators to use hill-top sites for base stations and backhaul.

There has been sustained private investment and impressive customer take-up of broadband services, as illustrated by the following examples³⁹ (as of October 2010):

- There were seven operators providing fixed broadband services using various technologies at speeds up to 1 Gbps;
 - 2.1 million subscribers were using broadband services in Hong Kong China, representing a household penetration rate of 83 per cent as of January 2011;
 - About 86 per cent of households were served by at least two self-built networks, and close to 70 per cent were served by three; and
 - According to a survey published by the FTTC Council in February 2010, Hong Kong China ranked third at around 33 per cent household penetration among all the economies that have deployed FTTH or FTTB.
- (c) De-regulation of fixed-mobile interconnection charges in April 2009 by OFTA was intended to facilitate cross-platform competition in the era of fixed-mobile convergence. This represents another

key advantage of an attuned converged and integrated regulator that is agnostic to technology choices.

In the past, fixed operators used to receive an interconnection charge from mobile operators. The validity of this charge was seen by OFTA to be very dubious. Whilst initially the fixed network operators cried foul when the interconnection charges were deregulated and wanted a long transition period to minimize the impact, OFTA nevertheless proceeded to deregulate in an efficient manner. In the end, except for a single case of dispute between the incumbent fixed operator and a mobile operator, most fixed and mobile operators have been able to settle on some form of agreement or understanding on an interconnection charge based on the “bill and keep” model.

1.5.5.3 Summary

In summary, with a high density population in an urbanized environment and high penetration rates, Hong Kong China has opted to remain faithful to pro-market mechanisms, facilities-based competition, technology neutrality, light handed regulation, and a dependence on totally private investment in telecommunications. As a result, Hong Kong China has been able to maintain consistency, continuity and certainty in its policies for the telecommunication sector and in encouraging innovation. Whilst these circumstances are not reflected in most countries, Hong

Kong China nevertheless gives us some understanding of the future dynamics we are moving towards as penetration of broadband increases, and urban population density grows.

Conclusion

Sections 1.4 and 1.5 have provided a framework for analysing the constituent elements of a National Broadband Plan. Examples of progress and decisions made in individual countries against a background of six levels of decision making have been presented and the Decision Tree tool has been introduced, with options that exist at each level of decision making.

The Plan itself is as much a social contract as a plan of action to develop the industry base. Therefore, as stressed throughout this Discussion Paper, the most inclusive and wide-ranging consultation and involvement are necessary to ensure that the monumental investments ahead are based on the collective decisions of the best minds available in government, industry, and society.

There is no single, comprehensive blueprint for best practice, but learning from other countries’ experiences at each level of decision-making is possible. This report may assist in the formulation of a Plan by providing some pointers about where to look when tailoring the cloth to suit a particular set of national circumstances – for both developed and developing countries.

CLOSING DIALOGUE

ITU-D to Regulator: *“Well, that should assist you with working out the road ahead”*

Regulator: *“Yes and No”*

ITU: *“Excellent. Your answer shows you are now comfortable with the concept of dealing with options”*

ACKNOWLEDGEMENTS

The author would like to acknowledge the cooperation and guidance of the following people in developing the mini-Case Studies :

- **Fiji** : H.E. Mr Aiyaz Sayed-Khaiyum, Attorney General and Minister for Communications; Mrs Elizabeth Powell, Permanent Secretary; and Mrs Mere Rakuita, Chairperson of Telecommunications Authority of Fiji.
- **Papua New Guinea** : Mr Charles Punaha, CEO National ICT Authority (NICTA); Mr Kila Gulo Vui, Director Regulatory NICTA.
- **Argentina** : Mr Facundo Fernandez Begni, and Ms Solana de Aspiazu, Comisión Nacional de Comunicaciones, the Regulatory Authority of Argentina.
- **Brazil** : Mr Bruno Ramos, Agência Nacional de Telecomunicações (ANATEL), the Regulatory Authority of Brazil,
- **Hong Kong China** : Mr Y.K.Ha, Deputy Director General, The Office of the Telecommunications Authority (OFTA), Hong Kong China.

The author is also very grateful for the support and information provided by ITU staff, especially Nancy Sundberg and Youlia Lozanova.

¹ For instance, the *GSR10 Discussion Paper on the Impact of Broadband on the Economy* and the work on developing a model National ICT Plan developed in the framework of the joint ITU-EC Project *“Capacity Building and ICT Policy, Regulatory and Legislative Frameworks support for Pacific Island Countries (ICB4PAC)”*. See also the following ITU broadband case studies: *“Towards Universal Access to Broadband in Australia : a case study”*, *“Towards Universal Broadband Access in New Zealand”*, and *“Bringing Broadband to Rural Areas : a Step-by-Step Approach, the Experience of the Dominican Republic”*. The full reference to these sources is given in the bibliography along with other sources of information.

² Data over Cable Service Interface Specification.

³ Long Term Evolution.

⁴ ITU, *GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies* by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html

⁵ Martin Cave, *Making the Ladder of Investment Operational*. November 2004

- ⁶ ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ⁷ These cases are discussed in depth in the ITU GSR10 discussion paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ⁸ Some Mini-Case Studies are presented later in Section 1.5 of this paper.
- ⁹ ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ¹⁰ ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ¹¹ ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ¹² ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ¹³ ITU, Towards Universal Broadband Access in New Zealand. By Sean Mosby and Jerome Purre, November 2010, www.itu.int/ITU-D/treg/Documentation/ITU_UAB_NZ_2010.pdf
- ¹⁴ See OECD Economic Survey – Australia. Vol. 2010/12 – November 2010, Supplement 3.
- ¹⁵ *Ibid.*
- ¹⁶ Build Operate and Transfer model.
- ¹⁷ ITU, Bringing Broadband Access To Rural Areas: A Step-By-Step Program for Regulators, Policy Makers and Universal Access Administrators. The Experience of the Dominican Republic. By Edwin San Roman, www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR09/doc/GSR09_Background-paper_UAS-broadband-DR-web.pdf.
- ¹⁸ ITU, Bringing Broadband Access To Rural Areas: A Step-By-Step Program for Regulators, Policy Makers and Universal Access Administrators. The Experience of the Dominican Republic. By Edwin San Roman, www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR09/doc/GSR09_Background-paper_UAS-broadband-DR-web.pdf.
- ¹⁹ Sun Tsu was the most famous Chinese general of history, whose tactics are now almost worshipped by the corporate world and are translated into the business warriors “bible” in the book titled “The Art of War”.
- ²⁰ The Output based Aid (subsidy) is discussed in greater details in the GSR1 discussion paper on Strategies for Financing Universal Broadband Access.
- ²¹ ITU, GSR10 Discussion Paper on Understanding the impact of broadband on national and global economies by Dr. Raul Katz., www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html
- ²² ITU, National Broadband Strategies Overview. ITU WSIS Team 20/11/2010.
- ²³ 8 services, 3 infrastructures, and 9 technology growth engines.
- ²⁴ Republic of the Fiji Islands. Telecommunications Promulgation 2008 (No.1 of 2008).
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- ²⁶ See the Case Study in section 1.5.4 below.
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- ²⁸ Oxfam International, From Poverty to Power. By Duncan Green, 2008.
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- ³⁰ That is, percentage of population with access to a fixed line or mobile phone.
- ³¹ PNG Resources. Issue 4, 2010.
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- ³⁹ Ibid Footnote 34

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