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## The Indian broadband plan: A review and implications for theory

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### ABSTRACT

Given the benefits of ubiquitous broadband deployment and availability that include economic growth, participation in the Internet economy and increased competitiveness, several countries have launched major national initiatives to accelerate broadband deployment including supporting such initiatives often as a part of their fiscal stimulus plans. These include Afghanistan, Australia, Brazil, India, Japan, New Zealand, South Korea, Singapore, Sweden, UK and USA and the European Union as a whole.

Despite the initiatives of developing countries, the broadband gap in terms of deployment and adoption between them and developed countries is increasing. There is recognition that there are significant challenges in designing the institutional infrastructure required for broadband deployment, which are accentuated in a developing country context due to the weak existing institutional environment. But since the impact of telecom and, broadband in particular, is more significant in developing countries than in developed ones, policy makers in developing countries are increasingly focusing on National Broadband Plans (NBPs). For example, policy makers in India realize that broadband can accelerate the increasing contribution of the service and knowledge sectors to India's economy and also help to alleviate its poor physical service delivery in areas such as health, education, banking, etc. and have adopted a broadband plan.

This paper documents the development of the Indian NBP. Based on prior studies, we identify key factors that contribute to success of broadband deployment and adoption and based on these, we assess the Indian NBP. Further, it uses the framework of multiple streams (Kingdon, 1995) to critique the policy formulation and agenda setting aspects of NBP in an emerging economy. We also highlight the key differences in the policy making processes in developed and developing economies. Given the inter-linkages and complexities of implementing a broadband strategy, we identify the role and attributes of a policy entrepreneur that are critical to evolving the policy, in a developing country context and how these differences lead to the primacy of the role of policy entrepreneur.

Thus, the contribution of this paper is in assessing the Indian NBP and providing insights in theoretical aspects of policy making in the realm of broadband in emerging economies, an area that has received little attention.

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<sup>1</sup> The views expressed in this paper are those of the author, and do not necessarily represent the views of their respective institutions.

## 1. Introduction

Given the benefits of broadband in facilitating economic growth, spurring the Internet economy and enhancing competitiveness, several developed and developing countries have launched major national initiatives to accelerate broadband deployment, or are formulating such strategies (OECD, 2011). These include developed countries like Australia, Korea, Singapore, Sweden, the USA and UK, as well as developing countries like Afghanistan, Argentina (Broadband Commission, 2013), Brazil (Jensen, 2011) and India (TRAI, 2010b). Like telecommunications, the effect of broadband on growth is stronger for developing countries than for developed countries (Qiang, 2010), overtaking those for the Internet and mobiles (Williams, 2006). Policy makers recognize that leveraging the benefits of broadband is a complex task as often the benefits of investments depend not only on availability but also on adoption and usage, the breadth of business activities covered by broadband, information intensity of the covered sectors and the network externality factors (Koutroumpis, 2009) that are inherent characteristics of such networks.

Further, the broadband gap, in terms of deployment and adoption between developed and developing countries, is increasing (Mulas, 2012 chapter. 7). Given the implications of broadband for economic growth, the increasing gap has led governments in developing countries to play a more active role in deploying broadband in comparison to cellular services. Such roles include developing a National Broadband Plan (NBP) or strategy that sets national goals and targets, proposes the institutional and funding framework includes support for content generation, development of capacity, and design of programs for adoption of ICT by governments and citizens, facilitates private sector investments, and makes direct investments (Bauer, 2010; Falch, 2007; OECD, 2011; Ofcom & DTI, 2007).

India is a large developing country, whose contribution from the service and knowledge based activities is increasing and constituted 55.2% of India's GDP in 2009–10 (Union Budget, 2011–12). From this perspective, provision of broadband is critical to its aim of becoming a knowledge economy. Broadband applications could also help to solve its poor physical service delivery in areas such as health, education, banking etc. Despite these benefits, investments must compete with those meant for poverty alleviation, food security, employment generation etc. In the latter areas, outcomes may be more tangible and immediate and thus have more acceptance from the political executives. Additionally, NBPs may require design and development of new institutional infrastructure or linkages, a challenge in any developing country, including India. Therefore, the first objective of this paper is to develop a framework to review the Indian NBP and compare its design with other NBPs from different countries to draw lessons from the same.

The second objective of the paper is to contribute to theory in the area of policy making in emerging economies as prior work in this area is limited, especially in relation to broadband. Most theoretical work considers policy making with respect to the institutional background and processes that are prevalent in developed countries, an environment that is very different from those in emerging economies. This paper uses the framework of multiple streams (Kingdon, 1995) to critique the policy formulation and agenda setting aspects of NBP in an emerging economy and highlights the differences in a developing country vis-à-vis a developed country and how these differences contribute to shaping the policy process.

## 2. Methodology

We used secondary data for the analysis of NBPs of different countries. We outline the Multiple Streams Framework that we use in this paper. In this approach, policy processes are visualized as consisting of three streams: problems, policies and politics. The problem stream “refers to the selection of issues that are considered significant social and economic problems”. The policy stream refers to the community of policy intellectuals, academics and other stakeholders who generate a number of options. The politics stream refers to the factors that influence the choice of agenda such as officials, functionaries, elections etc. The three streams are visualized as independent, but for successful agenda setting, more than one stream comes together. “Policy entrepreneurs”, aware of various options are willing to put together resources to ensure that their favored policies get selected for implementation, and put resources to make the streams converge.

## 3. Institutional structure and environment

### 3.1. Structure

The Ministry of Communications and Information Technology (MoCIT) was the policy making body for the sector. The Department of Telecom (DoT) was the government department responsible for the formulation of developmental policies, granting licenses for various telecom services, managing radio frequency in close coordination with the international bodies and enforcing wireless regulatory measures.

In 1984, the Mahanagar Telecom Nigam Limited (MTNL) was set up as a government owned corporate entity, subsequently partially privatized responsible for service provision in Mumbai and Delhi, the largest metros and the commercial and political capitals of the country respectively.

DoT had been the monopoly service provider until 1994, when the sector was opened up for competition from private operators, initially in mobile services. By 2000, the sector had been gradually opened up for private provision in all segments.

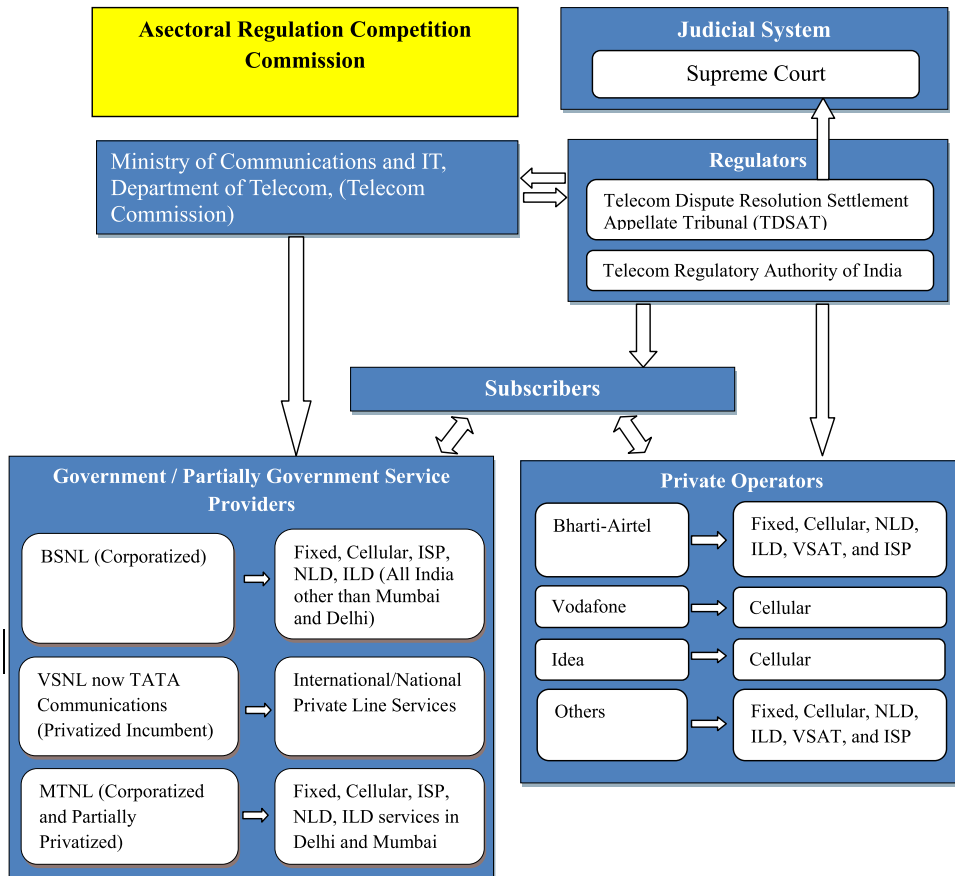


Fig. 1. Structure of the telecom sector in India.

In response to the need for a regulator in a multi-operator environment, the government set up the Telecom Regulatory Authority of India (TRAI) in 1997 under the TRAI Act. In 2000, a wholly government owned corporation, Bharat Sanchar Nigam Limited (BSNL) was carved out from the DoT as the operational arm for service provision. In the same year, the TRAI Act was amended to create two entities: TRAI and the Telecom Dispute Resolution Settlement and Appellate Tribunal, thus separating the developmental and adjudicating role of the erstwhile TRAI. The scope of TRAI included (i) giving recommendations in areas of introduction of a new operators, terms and conditions of new licenses, type of equipment to be used by service provider etc., and (ii) discharging of functions such as ensuring compliance of terms and conditions of licenses, fixing the terms of interconnection between service providers, regulating revenue sharing arrangement between service providers etc. The decisions of TRAI could be appealed against in the TDSAT, whereas the decisions of the TDSAT could be appealed in the Supreme Court. Fig. 1 gives the institutional structure.

Over time, driven by the boom in the mobile segment, the private sector had grown significantly, overtaking the public sector. As at the time of writing, there were four large private operators i.e. Bharti Airtel, Vodafone, Idea Cellular, and Reliance Communications with operations in multiple segments such as fixed line, VSATs, mobile, long distance, international long distance. BSNL operated in the mobile, long distance and the fixed line segments. Appendix A gives the relative size of these five operators along with their areas of operations.

### 3.2. Environment

Although an objective of the policy reforms undertaken since 1984 was to separate the policy making, regulatory and operational aspects of the sector, this was not achieved. This happened as BSNL was a government enterprise under the DOT and provision of budgetary support to TRAI and TDSAT from DoT constrained the autonomy. Moreover, personnel from DoT, BSNL and TRAI were appointed back and forth between these organizations, including at the highest level, thus making the role separation more difficult.

In terms of formal processes, there was no formally identified framework for interactions between DoT and TRAI. DoT usually made a reference to TRAI for its recommendations on various key policy issues. TRAI also brought out its recommendations on key policy issues *suo motto*. Sometimes DoT accepted TRAI recommendations without major changes,

although most times, it made significant changes<sup>2</sup>. This was seen as undermining the authority of the regulator. DOT having been the highest decision making body in the telecom sector until 1997, found it difficult to accept recommendations from an entity that was under it.

#### 4. The Indian national broadband plan

##### 4.1. Background

To review the context of Indian NBP, we examine the current status of both, wireless and wireline (fixed line and cable), and internet service provision to provide a perspective on the potential and challenges in design and deployment of NBP. We also review the developments that led to the formulation of the Indian NBP.

##### 4.1.1. Wireless and wireline infrastructure

As of December 31, 2012 (the initial target date of NBP related plans), there were nearly 865 mn mobile phones and 30 mn wireline telephones, which were overwhelmingly concentrated in the urban centres. This relatively small number relative to mobiles limited the spread of DSL as a mechanism for national broadband spread. The number of mobile phones was almost 30 times the number of wireline telephones (TRAI, 2012). The vast majority of these cell phones used 2G services (voice calling and text messaging), operators were also simultaneously deploying 3G services. The number of wireless broadband users may already exceed the number of wireline broadband users, estimated to reach 450 mn by the year 2020 as per Huawei India report<sup>3</sup>. There were nearly 165 mn Internet subscribers in India, with narrowband subscribers (excluding subscribers who accessed Internet through wireless phones) accounting for nearly 6.5 mn, the broadband subscribers (excluding subscribers who accessed internet through wireless phones) accounting for nearly 15.0 mn and subscribers who accessed internet through wireless phones accounting for nearly 143.2 mn as of March 31, 2013 (TRAI, 2013c).

The long haul core or the backbone connecting the major cities was largely fiber based. There was also a significant amount of fiber in the middle mile networks to the smaller cities and towns (Jain & Neogi, 2012). The real gap was in the last mile network infrastructure, both in the urban and especially the rural areas.

##### 4.1.2. Cable TV and DTH

Of the nearly 247 mn households (HH) at the national level (168 mn rural and 79 mn urban), TV owning HH were 148 million (79 mn rural, 69 mn urban), giving a TV penetration of 64% at the national level (52% in rural areas and 88% in urban areas). Of this, HH having a cable or DTH connection were estimated to be 85% (with 81% penetration in rural areas and 91% penetration in urban areas). The penetration of digital TV was 33% (40% rural and 25% urban) amongst those that had a cable or DTH connection (Ministry of Home Affairs, 2011; TAM, 2012). Cable as a platform for broadband needed to be reviewed as its penetration was only 50% at the HH level compared to nearly 70% at the individual level for mobile phones.

The cable infrastructure was weak, with disaggregated ownership amongst the nearly 60,000 local cable operators who often were small business entities, with analog systems and poor technical or billing systems, one way communication that lacked addressability. The lack of addressability resulted in deliberate misreporting of subscribers by the cable operators so as to reduce the income tax payable to the government and the revenue share with the upstream Multi Systems Operator. The digitalization of set top boxes would eliminate this practice. The government passed the Cable Television Networks (Regulation) Amendment Bill, 2011, mandating the digitalization of set top boxes to be completed by June 30, 2012 in a phased manner, covering first the metro and urban areas. However, these deadlines had been extended to December 2014 as there were ground level difficulties in implementation, such as availability of set-top boxes, customers' willingness to pay etc. Complete digitalization would take considerable time, especially in covering rural areas. It was dependent on the business case that cable operators saw in upgradation of their existing network for broadband. Other than in metros, large cities and business districts, such a case was poor. Further low percentage of HH having PCs (8%, as compared to 55% in China) and erratic electric supply were deterrents<sup>4</sup>. The availability of broadband using this medium was expected to be low in the next five years or so. It was only with proper upgradation, including the digital end user device and existing cable network, that it could be used for broadband service provision.

##### 4.1.3. The ISP industry

As of March 31, 2013, the total number of Internet subscribers in India was 164.8 mn out of which 143.2 mn (86.9%) accessed it over mobile phone, 15.1 mn were broadband subscribers (9.1%) and 6.6 mn were narrowband subscribers (4.0%) (TRAI, 2013b).

<sup>2</sup> [http://articles.timesofindia.indiatimes.com/2011-03-26/india-business/29191521\\_1\\_traai-recommendations-unified-licensing-telecom-regulator](http://articles.timesofindia.indiatimes.com/2011-03-26/india-business/29191521_1_traai-recommendations-unified-licensing-telecom-regulator), accessed on October 12, 2013.

<sup>3</sup> <http://www.tele.net.in/finance/item/10842>, accessed on January 19, 2013.

<sup>4</sup> <http://www.thehindubusinessline.com/industry-and-economy/info-tech/pc-replacement-market-beaten-down-by-economic-woes-says-dell/article5116323.ece>, accessed on October 15, 2013.

Top five wireless ISPs were Bharti Airtel, Vodafone India Ltd, Idea Cellular Ltd, Reliance, and Aircel Ltd – all mobile operators – with market share of 27.6%, 24.0%, 17.8%, 14.6%, and 8.5% respectively (TRAI, 2013b).

BSNL, Reliance Communications Infrastructure Ltd, MTNL, Bharti Airtel Ltd, and Hathway Cable & Datacom Pvt Ltd were the top five fixed line ISPs. BSNL, with a subscriber base of 13.1 mn Internet connections, held 60.7% of the total fixed line market share followed by Reliance with 11.5% and MTNL with 9.1% market share. DSL was the major technology with a market share of 59.1% followed by dial-up connections (19.1%) and wireless/wifi (12.8%) (TRAI, 2013b).

Internet on mobiles had become the predominant method of accessing the Internet. Overall, as in the case of cable, low PC ownership, poor electricity availability, internet and broadband through DSL and dial-up could not become widely adopted. This could deter ISPs from providing broadband over fixed lines, even if they had access to fiber.

#### 4.2. The Telecom Regulatory Authority of India's national broadband plan

In April 2010, the DoT sought a reference from TRAI on “review and definition of broadband connectivity”. Recognizing the role of broadband in the economy and to citizens, TRAI suo-motto enlarged the scope to have more comprehensive recommendations. It presented broadband as a driver of economic growth, and as a platform for implementing government programs on agriculture, education, banking and governance – priority sectors of the government. The government felt that broadband could help alleviate the poor state of physical service provision for especially in these areas. For example, there was a government plan to provide low cost tablets and Internet connections to students. This would help them to leverage the Internet for their education.

The TRAI Recommendations on NBP in December 2010 (TRAI, 2010b) envisaged provision of 75 mn broadband connections (17 mn DSL, 30 mn cable and 28 mn wireless broadband) by the year 2012 and 160 mn broadband connections (22 mn DSL, 78 mn cable and 60 mn wireless broadband) by the year 2014.

The recommendations for NBP had the following major components (TRAI, 2010b):

- An open access optical fiber network connecting all habitats of population of more than 500 and above to be completed in two phases. In the first phase, all cities, urban areas and village administrative units (gram panchayats) to be completed by 2012. Habitations of population of more than 500 to be completed by 2013.
- The design was based on FTTX for urban areas as well as for connecting to the villages in a phased manner, using the existing fiber based connectivity of all cities as backhaul.
- Setting up of a 100% central government owned agency National Optical Fiber Agency (NOFA) and a State Owned Fiber Optic Agency (SOFA) in each of the states. NOFA was envisaged as a “wholly owned holding company responsible for overseeing the overall architecture, planning, procurement, deployment and maintenance of the shared fiber infrastructure” (TRAI, 2011). NOFA would have the necessary scope to be able to raise finances and take equity stakes in the SOFAs. SOFA would have 51% equity held by NOFA and 49% by the respective state governments. The SOFAs would be responsible for establishing the networks and backhaul in the rural areas and in the urban areas other than those cities covered under the Jawahar Lal Nehru Urban Renewal Mission (JNURM).
- The shared infrastructure of NOFA and SOFA would be made available on a commercial basis on TRAI regulated charges to any service provider, thus creating a revenue stream. NOFA would also be responsible for establishing the network in 63 cities identified by JNURM.
- Funds for this network would be provided through the Universal Service Obligations Fund (USOF) and the loan given/ guaranteed by the central government.
- Digitalization of the cable industry was integral to the NBP.
- In order to ensure affordability of customer premises equipment, it was envisaged that the government would review the duties levied on inputs and finished products used in providing broadband and Internet services.
- The optical fiber network would support following download speeds (upload speed would be half of the download speed) at the household level by 2014 for every wireline connection:
  - 10 Mbps in 63 metro and large cities (covered under JNURM).
  - 4 Mbps in 352 cities.
  - 2 Mbps in towns /villages.

The rationale for these speeds was based on the assumption that in future high bandwidth applications based on video would become prevalent. Metros and larger cities (with population above a million) were modeled to have penetration of 36% and 60%, while the same for cities with population between one and ten million was assumed to be 23% and 48% and for villages these numbers were 8% and 20% for 2012 and 2014 respectively. The last mile connectivity in villages was assumed to be wireless until 2014.

#### 5. Emergence of the existing NBP

Recognizing that future growth of the Indian economy would depend on leveraging the knowledge sector and innovations, the government of India had set up an office of the Advisor to the Prime Minister (PM) on Public Information



Infrastructure and Innovations (PIII). The proximity of this office to the PM highlighted the importance of these aspects at the highest level. Mr. Sam Pitroda was Advisor to the Prime Minister of India on PIII and headed various key initiatives of the government such as the National Innovation Council and Expert Group for Modernization of Indian Railways. The PIII had been working with a variety of stakeholders for connecting the 250,000 village administrative units with high speed (100 Mbps) broadband network. It envisaged a National Optical Fiber Network (NOFN) as a mechanism that would “transform governance, service delivery and unleash local innovation capacity through rural broadband”<sup>5</sup>. The government planned to complement the hardware with the requisite software and applications to support the same. For this it planned to bring together the Ministries of Rural Development, Panchayati Raj<sup>6</sup>, Human Resource Development (HRD), Health and the National Council on Skill Development. This would enable appropriate and relevant applications and capacity building to leverage NOFN.

The DoT created a high level committee (HLC) under the PM's Office headed by Mr Sam Pitroda and Mr Nandan Nilekani, Chairman, Unique Identification Authority of India on April 26, 2011 to implement the NOFN. Given the high profile and visibility of this initiative and DoT's role in setting up the Committee, TRAI's plan acquired lower significance.

The HLC was responsible for developing a framework for implementation including the technological architecture, budgets and other issues related to NOFN. It suggested creation of special purpose vehicle – Bharat Broadband Network Limited (BBNL) – a new public sector undertaking wholly owned by the government. BBNL would establish, manage and operate the NOFN<sup>7</sup>.

For building the NOFN, BBNL would work with three public sector units, (i) Bharat Sanchar Nigam Limited (BSNL), (ii) RailTel Corporation of India Limited (RailTel), a wholly owned subsidiary under the Ministry of Railways, and (iii) Power Grid Corporation of India Limited (PGCIL), the central transmission utility under the Ministry of Power. RailTel had the objective of creating a nationwide broadband and multimedia platform for train operations and safety and to contribute to telecom growth in the country. PGCIL had a key role in the implementation of the recommendations of the India Smart Grid Task Force, headed by Mr Sam Pitroda. For the smart grid, PGCIL envisaged usage of its fiber optic network.

BBNL would take on lease the existing infrastructure of these three public sector units and would lay the incremental fiber optic required to connect to the village administrative units. BBNL would provide non-discriminatory access to all ISP, telecom and cable service providers and other retailers. The ownership of the fiber optic shared infrastructure would be that of the respective agencies (BSNL, RailTel, and PGCIL).

HLC envisaged that instead of the SOFAs, the tripartite Memorandum of Understanding between the Department of Telecommunications (DoT), the concerned state and the executing agency would help to get Rights of Way, otherwise a time consuming activity in the states.

Thus, the changes implemented by the HLC created a high level execution agency – BBNL, which was different from the structure of the TRAI model of NOFA and SOFAs. There was no provision of urban broadband in the HLC plan, although the TRAI plan had details about types of cities to be covered in different phases. Both the TRAI and the HLC considered connectivity up to the village administration, whereas TRAI additionally considered connectivity up to the habitation of 500 or more. There was no mention of cable infrastructure in the HLC plan. Since the HLC and the TRAI plan differed on the dimensions identified above, TRAI attempted to influence the government decisions by writing to DoT. However, DoT did not accept the issues raised by TRAI and justified that the HLC plan was better. Subsequently, it was the HLC model of broadband that prevailed (TRAI, 2011) and was being implemented. Neither plan provided models for last mile connectivity from the village administration termination point to the end-user including, entities that would be involved in the same, their interface with upstream service providers, funding and service provision models.

In order for TRAI's plan to be accepted, it would have to build constituencies both through formal and informal interactions in its support. Given the dependence of TRAI on DoT, in those cases where DoT had a plan different from TRAI, then it was likely that the latter plan would prevail.

## 6. Current status of Indian NBP

The NOFN had an estimated cost of Rs 200 bn<sup>8</sup>. The initial target of reaching 250,000 village administrative units by December 2012 was first shifted to December 2013 and as of September 2013, it had been further shifted to September 2015<sup>9</sup>. Until April 2013, tripartite agreements with the states and union territories covering nearly 226,500 village administrative units had been signed. Pilot projects in a few administrative units had been rolled out.

Fiber connectivity as a part of the NBP to village administrative units could take a long time, as BSNL, the key entity with large amounts of fiber in relation to the other, had a poor track record of implementation. Further, the need to coordinate across Railtel and PGCIL was likely to delay roll-out. Since there was little public support for wireless broadband from the point of termination, household or individual access to broadband in rural areas would remain very sparse.

<sup>5</sup> National Knowledge Commission, <http://knowledgecommission.gov.in/>, accessed on October 11, 2013.

<sup>6</sup> Gram Panchayats are village administrative units.

<sup>7</sup> <http://www.bbnl.nic.in/content/faq/what-is-bbnl.php>, accessed on October 14, 2013.

<sup>8</sup> \$1 = 60 INR approx.

<sup>9</sup> <http://www.indianexpress.com/news/telecom-commission-approves-phased-rollout-of-rs-20k-cr-nofn-project/1170873/>, accessed on October 11, 2013.

## 7. Analysis of India's NBP

It is recognized that features of successful broadband policies in developed countries such as in Australia Canada, Denmark, Japan, Korea, UK (Frieden, 2005; Kim, Kelly, & Raja, 2010; Van Gorp & Maitland, 2010) may not be relevant to developing countries due to specific contexts in the latter. Characteristic attributes in developing countries such as weak institutional environment (Karunasena & Deng, 2012; Khanna & Palepu, 1997; Kshetri, 2007) often lead to poor regulation and lack of competition (Van Gorp & Maitland, 2009). Poor level of existing technology infrastructure (Fosu, 2011; Katz, 2009; Kim, Kelly, & Raja, 2010; Yoon & Chae, 2009) and low levels of adoption or inadequate demand creation (Brännström, 2012; Bogojevic, Gospic & Petrovic, 2010) were other key challenges. Studies cited above have identified factors that are likely to lead differential outcomes of broadband in developed and developing countries. Based on these dimensions, we analyze the role of institutions/organizations/policy models, existing infrastructure and demand creation/adoption policies in the Indian NBP to assess the extent to which these elements are likely to contribute to its success.

### 7.1. Institutions/organizations/policy models

Efficient public organizations have been considered as sources of public value creation (Moore, 1995). In many developed countries, separate organizations were set up to manage broadband deployment as it was felt that without adequate focus, such critical initiatives would not fructify. For example, in UK, Broadband Delivery UK (BDUK), a unit within Department of Culture Media and Sports, was responsible for managing the UK government's broadband funding. In Australia, a new wholly government owned corporation, the National Broadband Network Company (NBN Co), had been set up to implement and manage the operation of the planned national broadband network. In contrast, in India, there was no specific organization set up to manage NBP, leaving it to the prominence of the HLC to implement the NBP. The Indian approach made the success dependent on individuals and committees rather on long term vision, mission and objectives associated with organizations.

#### 7.1.1. Policy models

The policy models used to implement NBP often differ among the developed and developing countries. In developed countries key aspects around which policy models are developed are based on existing proliferation of wired infrastructure, the role of competition between cable and telecom networks, local loop unbundling, high literacy rates, higher propensity to adopt smart phones etc. In developing countries, the wired infrastructure is sparse, leading to a lower focus on competition and local loop unbundling. Since a comparison on these dimensions is not feasible, we therefore, consider the more general aspects of the adopted policy models such as the scope of service provision and scope of private participation. For example, the scope of BDUK was to provide greater access speeds and higher quality connectivity at the wholesale level to the final third (or the commercially unviable part) of UK through Public Private Partnerships (PPPs). British Telecom, the largest telecom provider and Virgin Media, the largest cable provider would provide broadband to two thirds of the more commercially viable population. In Australia, NBN Co was designed as a bandwidth wholesaler to provide non-discriminatory access to Internet and telecommunications service providers who in turn may provide retail services to end users. NBN Co had signed an arrangement with Telstra, the dominant Australian national telecommunications carrier, whereby Telstra's core network infrastructure has been turned over to the NBN Co for a total consideration of some \$11 billion, with Telstra becoming the largest user of the NBN Co, in its service provision role.

In contrast to the Australian case, BBNL would not directly own the broadband infrastructure but lease out the existing networks from identified PSUs and own only the incremental infrastructure where greenfield expansion was required. This could lead to lower control over the roll-out and quality of the network. Given the weak institutional environment in India, such an arrangement could lead to delays in deployment due to interface issues between different organizations involved. The positive aspect of the Indian model is that in its resource constraint environment, the Indian model exploits the existing infrastructure to the extent possible.

Further, unlike the UK model, in the Indian case, there is no framework for separating out the commercially viable and unviable segments. Some of the village administrative units that are closer to urban areas could be commercially viable. On another dimension, the efficiencies in implementation in the PPP model as in UK are expected to be higher, due to the commercial orientation of the private operators. In contrast, in the Indian initiative there was little scope for leveraging such efficiencies from the private sector. This could delay the NBP roll-outs as incentives for early or efficient roll-outs are low in public sector organizations.

### 7.2. Existing technology infrastructure

A review of the existing NBPs in developed countries shows that the technologies of focus were country specific. In Australia, given its low population densities and large uninhabited areas, the NBN Co selected fixed, fixed-wireless and satellite whereas UK focused on fixed and mobile connectivity. In India the NBP did not take into account the ground realities. The focus was on fixed, although considering the greater ubiquity of mobile and the very sparse wireline infrastructure, there should have been a significant focus on wireless mobile broadband.

While TRAI did consider the wireless option, it did not present a plan for making spectrum available, the wireless bands or the agencies responsible for wireless broadband deployment. Similarly, the HLC laid emphasis on the NOFN, with little focus on wireless. Prior spectrum management policies of the government had been ad-hoc leading to inadequate availability of and pressure on spectrum for all operators (Varadharajan & Prasad, 2011). The NBPs in developing countries need to focus on mobile broadband connectivity and plan for advanced technologies and spectrum as for LTE in a systematic manner. For example, while LTE could be provided in any of the several ITU identified bands, making it available in bands with better propagation characteristics such as those in 700 MHz and 800 MHz band would reduce deployment costs. Further, if developing countries harmonized their mobile broadband services with those bands where equipment is cheaper, it would help in faster uptake. For example, since LTE roll-outs in the 700 MHz and 800 MHz bands have already happened in USA and Europe respectively, equipment in these bands is likely to be less expensive (Mulas, 2012). However, in India, plans for 700 MHz and 800 MHz had not been clear (TRAI, 2013a).

### 7.3. Demand creation/adoption policies

Since past studies have identified the role of demand creation, content availability, access, quality, and adoption etc., it is likely that more integrated programs have higher likelihood of success. For example, Japan, South Korea adopted broadband strategies as a part of national plans that focused on the adoption and use of ICTs for enhancing competitiveness and productivity of their economies. Korea and Taiwan had broadband strategies that focused on services and applications. For example, Korea provided extremely cheap computers to its citizens so that they would feel comfortable using PCs and drive adoption of broadband (Korea, 2007). Additionally, such programs focus on creation of telecentres, supporting digital literacy, subsidy on access devices, especially for disadvantaged groups, etc. (Bouras, Giannaka & Tsiatsos, 2009; Howell, 2002; LaRose, Gregg, Strover, Straubhaar & Carpenter, 2007). However, the Indian NBP is a stand-alone program to improve broadband connectivity with little explicit focus on content generation and involvement of other ecosystem partners. Neither the TRAI nor the government plan detailed such mechanisms. For example, TRAI and the HLC could have leveraged the highly focused programs such as National Rural Health Mission<sup>10</sup> that were designed to deliver health services to rural areas for driving broadband or explicitly supported development of local language content or the ecosystem of device manufacturers, system integrators, which was an aspect of Korea's broadband strategy.

### 7.4. Summary

On the whole, the Indian NBP was deficient on several dimensions, including being a stand-alone program that was not integrated with other developmental programs, having unrealistic time frames, being largely dependent on government funding without adequately leveraging the private sector, and not having the right tools that matched with the requirements. For example, for upgrading the wireless infrastructure, especially in rural areas, HLC or TRAI needed to come up with a plan for making spectrum available for future wireless broadband networks that could provide a wide variety of affordable services. To drive demand, the government could develop a plan for having mobile enabled web services for the citizens. For greenfield expansion of the backbone, working with existing infrastructure service sectors such as national and state highway authorities, railways and power utilities that are also in the process of undertaking greenfield expansion could be considered so that development of the fiber backbone is concurrent with development of networks in these sectors. This way, the low level of existing infrastructure, and the Right of Way issues that contribute to delays would also get largely addressed. Such an approach had been adopted by the FCC in its NBP.

The organizational structure and processes adopted as a part of the NBP are likely to determine the success of such national initiatives. The formation of HLC may have given NOFN high visibility but the sustainability and acceptability of its initiatives would be challenging as HLC is a committee and not an organization. Further it would need to ensure that the design for implementation incorporates involvement of a variety of institutions and organizations at all levels.

Political acceptance of NBPs is reduced if there are delays in visible benefits owing to the high investments they require. This happens as there is a high pressure on resources and other plans which yield quicker benefits may get prioritized. Therefore, NBPs in this context must be carefully crafted, presented and implemented.

## 8. Framework for policy development

We analyze the theoretical aspects of policy making and agenda setting in the context of Indian NBP and see how it differs from that in developed countries. We use the Kingdon's (1995) framework for this purpose, and analyze the Indian NBP in terms of the problem, policy and politics stream.

<sup>10</sup> <http://nrhm.gov.in/about-nrhm.html>, accessed on October 11, 2013.



### 8.1. The problem stream

In the Kingdon model of policy making (Kingdon, 1995), the way problems are structured and presented is critical to the agenda setting process as it determines who/what agency gets involved and the alternatives that are generated. The problems that get to be on the agenda emanate from the “indicators, focusing events, and feedback” or political events (Kingdon, 1995).

We see that TRAI and the HLC framed the broadband policy design in terms of ‘broadband as a driver of economic growth and as a tool in poverty alleviation and improving access with equity’. The framing of the broadband plan in terms of larger socio-economic issues such as economic growth, poverty and access had the potential to involve a larger variety of stakeholders and decision-makers than those in the telecom sector alone. However, the crafting of the broadband plan, both by TRAI and the HLC primarily focused initially on the infrastructure deployment precluded such involvement.

While the Indian NBP highlighted the socio-economic benefits of broadband, it did not focus on the conditions under which these could reasonably accrue, especially in a developing country context (ITU, 2012). This further reduced the scope of the agenda setting process. For example, countries that have higher IT adoption rates have benefitted more. The impact of broadband is higher when promotion of technology is tied to supporting new innovative applications in areas such as education and health. With no focus on the enabling conditions, there was, therefore, limited opportunity to frame the NBP in terms of some of the sectoral approaches highlighted above. Possibly, the high coordination costs, across different departments and ministries could have led the HLC to first focus on the physical network, as also, it would be easier to control network deployment, if managed by a single entity. We see that the problem stream did not consider a variety of perspectives, including the enabling conditions for identifying the agenda.

### 8.2. The policy stream

The policy stream envisages formulation of a variety of proposals. It is expected that multiplicity of options are generated from a combination of ideas. Policy design alternatives are likely to be influenced by the structure of decision-making in institutions, administrative capacity, influence of committees and experts in the sector etc. Policy networks or “the set of people who have a transnational character and create an environment for specific alternatives to emerge” (Atkinson & Coleman, 1992) play an important part. The policy “champions” or entrepreneurs supporting particular paradigms or alternatives are likely to frame them in a manner that evokes the interest of target constituencies and attempt to integrate their perspective with emergent situations. This enables them to put the proposal forward in a way that strengthens the logic of their alternative. Such initiatives may be considered as “conscious strategic efforts by groups of people to fashion shared understanding of the world ... that legitimate and motivate actions” (McAdam, McCarthy & Zald, 1996, P. 6).

In the Indian case, the institutional processes by which a variety of policy options that are envisaged through interaction of interest groups, specialists researchers, government bureaucrats was missing. While TRAI has a public consultation process, it was not a directed effort by TRAI to involve think tanks and specialized groups in generating alternatives. The non-involvement of inter-sectoral groups further reduced the scope of options. Though it appears that TRAI Consultation Paper (TRAI, 2010a) adopted the NBP framework from the policy network of institutions such as the World Bank (Kim, Kelly, & Raja, 2010), there was no explicit involvement with these networks or institutions in fleshing out the NBP. On the other hand, the policy option generated by the HLC emanated within it and its supporting team and made no reference to the TRAI plan. There was no mechanism to influence or review those policy options by external entities. Thus the weak institutional structure and the process adopted for creation of policy outside the formal organizations responsible for crafting it created a weak policy stream.

### 8.3. The politics stream

In the Kingdon framework (1995), the politics stream refers to the factors that influence the choice of agenda such as officials, functionaries, elections etc. Since the three streams are considered independent, the role of a policy entrepreneur in identifying a “window of opportunity” that brings the three streams together and enables a particular policy to be formulated is considered critical.

In the politics stream, we can see how the HLC drew its set of proposals which were significantly different from the TRAI formulations. The role of the policy entrepreneur, Mr Sam Pitroda was important in putting together the HLC elements and giving a framework for design and implementation of NBP.

## 9. Analysis of the policy making process in the context of a developing country

In the present case, several of the dimensions that are envisaged in the Kingdon framework were either weakly present or were not there. As the work of (Liu & Jayakar, 2012) have identified, the problem stream is weak in many developing countries. The process by which the relevant policy competes for attention from amongst the several that could be selected through a public discourse or media focus is not prevalent in many developing countries, often due to lack of institutional structures and processes. The development of policy framework often outside the designated departments/ organizations,

gives primacy to the political or professional linkages of the policy entrepreneur as was the case of formulation and acceptance of the HLC model vis-à-vis the TRAI model.

The problem stream and the particular formulation of the NBP was driven by Mr. Sam Pitroda, who as a policy entrepreneur, sensed the importance of various current issues, gauged the relative acceptance of the issues amongst the top policy makers and was able to develop a broad roadmap of the implementation by bringing together existing organizations. Based on his prior work with the government, where he headed several technology missions during the mid-1980s and led the national initiative of developing indigenous rural exchanges, he had built professional relationships with existing top decision makers in a variety of fields and across the political and executive levels in the government and the industry. In a developing country context, prior track record of the policy entrepreneur in implementation may be given primacy over the processes that generate a variety of options as envisaged in the Kingdon framework. Thus, as a policy entrepreneur, Mr Pitroda played a key role in the framing of the policy agenda, and was able to configure “the timing, policy ideas, strategic interests, and political institutions in policymaking” in a way so as to get the “support of powerful actors that have an interest in promoting them” (Goldstein & Keohane, 1993).

Since the policies and processes by which government decisions are undertaken are framed within the context of existing institutions, interest groups, and policy networks, the policy entrepreneur must be able to articulate the policy in terms of the different interest it would serve for the actors involved. By focusing on ‘Connectivity to gram panchayats’, Mr. Pitroda as a policy entrepreneur, paid close attention to problem definition and ensured that it got political legitimacy. Serving the rural poor is an important agenda for any government especially those in developing countries and any policy explicitly claiming to do so, has a greater chance of acceptance. This aspect became even more important in the existing government regime that has implemented a number of “pro-poor” policies such as large scale employment guarantee schemes (Price, 2011), national rural health insurance scheme (Nandi, Ashok & Laxminarayan, 2012), etc.

In addition, the HLC’s formulation of the NBP presented it as a tool to plug the gaps in the weak current governance context. Since governance, especially at the rural level is often weak partly due to lack of information about available policies, peer group processes etc., the NBP showed how this could be overcome by broadband. The NBP envisaged connecting village administration units, indicating its focus on governance. This would facilitate provision of various citizen services such as issuing birth and death certificates, land records, using ICT. Since villages had poor ICT infrastructure, citizens living in rural areas could not avail such services. The high cost of providing ICT infrastructure and the lower propensity to pay in rural areas reduced incentives for the private sector to provide such infrastructure. The HLC envisaged that the NOFN would facilitate access to a variety of such services. This manner of presentation of the policy agenda enabled wider support than those of only the direct sectoral stakeholders, (Dowding, 2008; Schneider, 2006); although in reality, the NBP has focused predominantly on connectivity.

Mr. Sam Pitroda’s framing of the NOFN as an access mechanism for e-governance and provision for support for applications that would be useful to rural citizens made it acceptable to the public and powerful stakeholders – an important aspect-more so in a developing country, as benefits of a broadband infrastructure may not be evident and the resource allocation for it would need to contend with resources for policies in other areas of development such as basic physical infrastructure (roads, railways etc.), education and health. Another example of this approach was by selecting BSNL, a public sector enterprise for a key role in the execution of the NBP, especially since there was a popular sentiment that public sector execution would cost less than private sector. Also since the financial position of BSNL had been poor such a project could lead to a better financial position for it, thus strengthening buy-in from the political executives.

In Kingdon’s framework (Kingdon, 1995), inputs from the policy stream come through a variety of stakeholders including institutional structures think tanks, academia, civil society and advocacy groups. In a developing country, since existing institutions are weak in terms of their capacity and the ability to form inter-linkages with similar organizations (Andonova, 2006; Boubakri, Cosset & Guedhami, 2005; Quéré, Coupet & Mayer, 2007), inputs to the policy stream were limited.

Further, given the very hierarchical nature of the bureaucracy, it is seldom that bureaucrats put forth in public views that differ from those of the people senior to them. The various departments usually work in silos and there are no formal mechanisms to seek inputs from others. In particular, since the relationship between DoT and TRAI is not formally laid out and DoT’s approach was not consultative, the policy stream did not have the scope for the recombination of ideas from the “policy primeval soup” (Kingdon, 1984). This created an environment where the policy entrepreneur was likely to lead the development of the policy and delineate of the role of various agencies likely to be involved in the policy implementation process.

Kingdon’s framework envisages the role of the policy entrepreneur in bringing together the three streams and identifying a “window of opportunity”. Our case study showed that the role of a policy entrepreneur lay predominantly in bringing together the agenda of different high level decision makers in shaping the HLC policy agenda, at the “problem stream stage”. Thus, the role of the policy entrepreneur differs in a developing country context than the one in a developed world.

Further, the case study shows that the three stages of policy making were not as distinct as brought out in the Kingdon’s framework. This finding is supported in the works of Liu and Jayakar (2012). The work of Robert and King (1991) highlights the different processes and activities employed by policy entrepreneurs such as idea generating activities, strategic activities such as developing demonstration projects, lobbying activities etc. In the Indian context, such activities were limited.

The role of the policy entrepreneurs thus spanned across the three stages though the stages themselves were not so clearly delineated in a developing country context. It ranged from development of the policy, framing it in an appropriate manner, seeking linkages across different high level decision makers to acquire political acceptance, and identifying the role of implementing agencies.

## 10. Conclusions and recommendations

We documented the development of the Indian NBP and provided the policy and organizational context for it. Based on prior studies, we identified key factors to assess the Indian NBP. We highlighted the need to tailor the NBP to fit particular national market and institutional structures. For example, while the Indian NBP, like other good strategies, needed to incorporate elements from successful strategies in different countries, it also needed to contextualize various elements such as focus on mobile broadband and spectrum management. The involvement of a number of user agencies in broadband strategy can help drive demand. Since broadband deployment, unlike other telecom networks, requires coordination across a variety of ecosystem partners such as device manufacturers, broadcasters, cable operators, content developers, the Indian policy makers needed to focus on design of institutions with adequate scope and fine balancing across the roles of existing agencies. This would require them to include a number of stakeholders in policy design and implementation. Further, major, long term broadband infrastructure deployment initiatives require significant public sector funding and must leverage efficiencies of the private sector where possible.

Models for policy making need to take into account the complexities involved in the policy process, especially in formulation and implementation of NBPs. The paper brought out the differences in the policy making environment in developed and emerging economies and the implications of it on the policy design outcomes. It examined one of the widely known models of policy making in the context of broadband policy in India and brought out the need to develop theoretical frameworks in policy making in emerging economies. The emergent role, attributes and processes employed by a policy entrepreneur in such a context in shaping the policy agenda was highlighted.

## 11. Future work

The deployment of broadband across many countries is a continuing task and as they move forward, the strategies often change, as they did in the case of NBN Co. Further research work is required to define the appropriate roles of governments, beyond the traditional regulatory and spectrum management roles, optimal institutional mechanisms, recognizing the need to tailor these roles to particular national circumstances. Detailed studies of the policy making process in emerging economies need to be done to not only be able to strengthen the theoretical work related to policy making but also to highlight some of the environmental factors that could influence policy making. NBPs provide a rich environment for such studies.

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## Appendix A

See Table A1.

**Table A1**

Top five telecom operators with revenue and area of operation.

Source: Voice and data, from various editions, available at <http://voicendata.ciol.com/>, accessed on October 11, 2013.

Sr No.	Service Providers	Revenue (Rs bn)								Category
		04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12	
1	Bharti Airtel	80	113	179	264	370	418	595	714	Mobile, broadband & internet, digital TV, Data and IP Solutions, wireless internet, Email on the go, calling cards, voice solutions conferencing
2	BSNL	363	402	401	353	352	321	288	284	Bfone Telephone, EPABX, ISDN, Tarang WLL service, MPLS VPN, Broadband, Leased Line, Telex Telegraph, Sancharnet Internet, Intelligent Network, I-Net, HV-Net, RABMN, INMARSAT, KU-Band, Transponder, CellOne Mobile Service
3	Vodafone	44	68	106	155	204	236	273	354	Mobile and wireless broadband
4	Rel. Comm.	54	108	145	186	229	221	231	204	Wireless, broadband, rural communication, Reliance World, Internet Data Center (IDC)
5	Idea Cellular	24	30	44	67	101	124	155	195	Mobile and wireless broadband
Total of Top Five		565	721	875	1025	1256	1320	1542	1751	

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