THE GEORGE WASHINGTON UNIVERSITY

INSTITUTE OF BRAZILIAN ISSUES

<u>XXXI MINERVA PROGRAM – SPRING 2012</u>

THE BRAZILIAN AND THE U.S. NATIONAL BROADBAND PLAN: A COMPARATIVE REVIEW ON POLICIES AND ACTIONS

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April, 2012

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ABSTRACT

The purpose of this research paper is to describe the policies, actions and goals of the Brazilian National Broadband Plan (PNBL), and to perform a comparative review with the recommendations taken from the U.S. National Broadband Plan (U.S. NBP). Brazil has enacted PNBL in 2010, through a presidential decree, which established several objectives and priorities to be attended by the telecommunications regulator Anatel, by an interministerial steering committee and by the then recreated state-owned operator Telebras. Different documents fixed the actions and goals of the PNBL, especially the "base document of the PNBL," which proposed 61 actions to be performed by 2014. The United States also developed its NBP in 2010, prepared by the telecommunications regulator FCC under a mandate included in the 2009 stimulus package. It contains over 200 recommendations for FCC, the Executive Branch, Congress and state and local governments, and goals to be achieved by 2020. The comparison showed that the discussion process of the PNBL could have been more open and transparent to society and to all interested parties if it had used the same instruments for participation adopted in the development of the U.S. NBP, like public consultations or public hearings. It also revealed that, unlike the U.S. NBP, the PNBL is not a broadband plan with an integrated view of objectives, actions and goals, but a sparse set of documents that established each of these in different time frames. As the PNBL is focused on infrastructure in order to create broadband supply, but neglects the creation of broadband demand, it concluded that the PNBL should incorporate actions aiming at applications and digital literacy programs, in order to avoid a gap between broadband penetration and adoption rates in the future.

Keywords: telecommunications, public policies, regulation, broadband.

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1. INTRODUCTION

1.1 The economic importance of broadband networks

Deployment of broadband networks has become a great concern for most countries in recent years, as it is considered crucial for fostering economic growth and national competitiveness, and for spreading the use and enabling improved performance of information and communication technologies (ICT).[1] (OECD, 2008)

Broadband networks allow high-speed, high-capacity and always-on connection to the Internet, and can be defined as a general purpose technology,[2] as they serve as "a communication and transaction platform for the entire economy" (OECD, 2009). Examples of new technologies available through broadband networks have been listed by Berkman Center (2010):

> *"telemedicine, particularly its extension to remote areas and the home for patient monitoring, smart grids and more efficient electricity use, better control of transportation systems, telecommuting, support for electronic commerce and payment systems and lower costs for businesses through infrastructure sharing on the cloud computing model, and better access to educational materials and experiences"* (BERKMAN CENTER, 2010, p. 25)

The Internet connection speed that characterizes a broadband network is not strictly defined, and each study or policy on broadband refers to different numbers. OECD (2008) states that "the term 'broadband' is typically used to denote an Internet connection with download speeds faster than traditional dial-up connections (at 64 kbit/s)." However, in its studies, this organization considers a minimum threshold of 256 kbit/s for broadband network classification.

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[1] Heeks (1999) defined information and communication technologies as "electronic means of capturing, processing, storing, and communicating information", and stated that ICT "comprise computer hardware, software and networks."

[2] As defined by Bresnahan and Trajtenberg (1995), general purpose technologies are key technologies in the process of economic growth, such as the steam engine, electricity and semiconductors, which are characterized "by the potential for pervasive use in a wide range of sectors and by their technological dynamism."

The International Telecommunications Union (ITU),[3] in its Manual for Measuring ICT Access and Use by Households and Individuals (ITU, 2009), also considers that broadband refers to connection speeds of at least 256 kbit/s on one or both directions. This distinction, however, is affected by the rapid technological evolution of communications networks, and in few years what is now considered broadband may be called narrowband.

Several studies have analyzed the impact of telecommunications infrastructure, broadband networks and ICT on economic development. Röller and Waverman (2001) investigated the effects of telecommunications infrastructure on economic growth, and found a positive casual link, provided that a critical mass of telecommunications infrastructure is present. Koutroumpis (2009) also found evidence of a critical mass phenomenon specifically in broadband infrastructure investment. Both studies showed that telecommunications and broadband infrastructures present network externalities, which imply a non-linear growth, so the return to further investment might increase whenever a significant network size is achieved. OECD (2003) provided evidence that ICT investment contributed to growth and labor productivity in its member countries, and that rapid technological progress in the ICT-producing industry contributed to rapid productivity growth.

Katz (2009) estimated Latin America needed an increase of 41% in broadband lines to fill its penetration gap, and that it would lead to a creation of 378,000 jobs. Qiang, Rossotto and Kimura (2009) found that broadband infrastructure benefits both developed and developing countries, although the later do not generate aggregate effects as robust as in the former, because penetration has not yet reached a critical mass. They also estimated that in high-income economies every 10% increase in penetration would lead to a 1.21% increase in gross domestic product (GDP) growth. For developing countries, this correlation reaches 1.38%. Katz (2010) estimated that a 1% increase in Latin America penetration rates generates 0.0178% GDP growth and 0.18% occupation rate growth. In Brazil, Macedo and Carvalho (2011) found that each 1% increase in penetration relates to an increase of GDP growth between 0.038 and 0.18%.

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[3] The International Telecommunications Union is the United Nations specialized agency for ICT, and it is "responsible for the allocation of radio spectrum and satellite orbits, and for the standardization and development of ICTs worldwide." (ITU, 2011)

Despite differences in the estimative, those studies clearly indicate that broadband investment has a direct positive impact on economy, and that a certain critical mass of built infrastructure has to be achieved in order to generate better network effects and higher returns. They corroborate what ITU (2003) stated as the rationale of promoting broadband:

> *"Benefits to users. Compared with narrowband, the increased speed and always-on nature of broadband enables the exchange of richer content, facilitates improved, expanded and more rapid communication, and allows the sharing of a connection with multiple users.*
> *Benefits to the economy. Broadband connectivity is helping to establish an 'information society'. It encourages innovation, stimulates growth in an economy, and attracts foreign investment.*
> *Returns on investment. Broadband holds the promise of new applications and services that will attract users and help recover infrastructure development costs."* (ITU, 2003, p. 3)

1.2 The development of broadband policies and National Broadband Plans

Many countries realized the importance of fostering the construction and use of broadband networks due to their impact on economy and society, and developed public policies focused on creating a critical mass of built infrastructure, lowering computer and connection service prices, fostering applications and content, and educating the population on the use of ICT, among others.

There are several strategies that governments can use to achieve such objectives, e.g. reviewing regulatory frameworks to support increased private sector investment, stimulating competition through regulation, unbundling incumbent operator networks, lowering taxes, granting public funds, using Public Private Partnerships (PPPs), setting up publicly owned operators to build and sell broadband, creating e-government,[4] services, adopting digital literacy programs.[5]

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[4] Fang (2002) defined e-government as "the ability to obtain government services through nontraditional electronic means, enabling access to government information and to completion of government transaction on an anywhere, any time basis and in conformance with equal access requirement."

[5] According to Martin (2005), digital literacy is "the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process."

ITU (2003) asserted that the following four factors characterize a successful broadband economy, despite differences in culture, landscape and technological development among nations:

> *"1. **Informing the public about broadband**. Efforts to promote demand for broadband depend largely on the target market being aware of the products available, and aware of what benefits broadband can provide them. Increased exposure to broadband should boost take-up rates. Growth should be rapid once penetration reaches a certain critical mass.*
>
> *2. **Making effective use of broadband through applications and content**. Broadband adoption is much higher in countries where users make full use of current broadband applications. This may include high usage of IP telephony, video/audio via broadband, online gaming, and telecommuting. Content in local languages also plays a key role. Policies that encourage these uses should boost penetration rates.*
>
> *3. **An environment that fosters broadband innovation**. Economies must have policies and incentives in place that create a fertile environment for broadband content and application development. This includes important issues such as thoughtful intellectual property protection, adequate government funding for Internet research, and consumers ready to participate in developing new, high-bandwidth applications.*
>
> *4. **A competitive market structure that keeps prices low**. There is no substitute for true market competition in broadband to reduce prices. Subsidies, grants, regulatory obligations and other financial support are only temporary fixes and cannot replace a well-functioning market. Efforts to ensure the market runs efficiently will have the greatest effect on prices, and in turn on broadband adoption."* (ITU, 2003, p. 7)

Over the past decade, policymakers in several countries enacted or at least discussed National Broadband Plans (NBPs) which group policies, actions and goals for broadband. Their common objective is to increase broadband penetration and adoption, and also to spread the use of ICT, although they differ on the strategies chosen, particularly on the level of government intervention.

OECD (2011), in a report on National Broadband Plans of its member countries, pointed that NBPs have links to many areas of government policy, as, for example: crime and justice; economics and finance; education and training; environment; health; industry; regional and rural development; science, technology and innovation; and transportation. As a consequence, some countries implemented formal coordination

mechanisms among ministries and agencies responsible for such areas, like the creation of a "broadband program steering group."

The report also highlighted that several countries held public consultations on NBP proposals, while many also created broadband forums to bring together operators, businesses and consumers to debate policy issues. Those initiatives may have contributed to develop plans' objectives and actions.

The report showed that NBPs have chosen different strategies to ensure the construction of broadband networks, either by the creation of state-owned operators, by the use of PPPs or by the reform of legal and regulatory frameworks. However, it affirmed that NBPs are increasingly concerned in setting targets for broadband adoption, rather than infrastructure construction and broadband availability.

As a consequence, new programs and interventions have been developed to complement economic measures, such as policies directed to digital literacy. Some NBPs included targets for "innovation in devices, applications, services and their use" and many plans focused on the provision of broadband to schools and to rural and remote areas, in order to increase population's awareness of broadband applications. Higher transmission speeds have also been addressed in most NBPs.

Table 1 presents a list of NBPs in selected countries, which shows that not only governments of developed countries, but also governments of emerging markets have been concerned with the enactment of policies to quickly deploy broadband networks:

Table 1: List of National Broadband Plans in selected countries

Country	NBP name	Internet link to the plan
Argentina	Plan Nacional de Telecomunicaciones "Argentina Conectada"	http://www.argentinaconectada.gob.ar//adjuntos/139/documentos/000/025/0000025555.pdf
Australia	National Broadband Network policy (2010)	http://www.dbcde.gov.au/funding_and_programs/national_broadband_ network
Brazil	Plano Nacional de Banda Larga (2010)	http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7175.htm
India	Broadband policy (2004)	http://www.trai.gov.in/broadbandpolicy.asp
	Recommendations on National Broadband Plan (2010) (proposal from the independent telecommunications regulator, after public consultation)	http://www.trai.gov.br/WriteReadData/trai/upload/Recommendations/ 124/Rcommendation8dec10cndiv.pdf
	National Telecom Policy (2011) (under public consultation till Dec 9, 2011 – incorporates broadband	http://www.dot.gov.in/NTP-2011/final-10.10.2011.pdf

	policies)	
Mexico	Agenda Digital.mx (in public notice as of 21 Dec 2011)	http://www.agendadigital.mx
Peru	Plan Nacional para el Desarollo de le Banda Ancha	http://www.mtc.gob.pe/portal/proyecto_banda_ancha/Plan%20Banda%20Ancha%20vf.pdf
United States	Connecting America: The National Broadband Plan (2010)	http://download.broadband.gov/plan/national-broadband-plan.pdf
United Kingdom	Digital Britain (2007)	http://www.bis.gov.uk/assets/biscore/corporate/docs/d/digital-britain-final-report.pdf
	Britain's Superfast Broadband Future (2010)	http://www.culture.gov.uk/image/publications/10-1320-britains-superfast-broadband-future.pdf

Source: prepared by the author

Brazil enacted its own NBP, called National Broadband Program (PNBL),[6] in 2010, through a presidential decree. The objective of the PNBL is to promote and disseminate the use and delivery of ICT products and services.

Several actions, goals and priorities have been established for achieving the objective of the PNBL, including the recreation of the once defunct state-owned operator Telebras, the use of spectrum auctions for wireless broadband services and the signature of an agreement between the government and fixed telephony concessionaires to make them offer fixed broadband connection for lower prices in selected municipalities.

The United States has also developed a National Broadband Plan in 2010, prepared by the Federal Communications Commission (FCC) under a mandate from the American Recovery and Reinvestment Act of 2009 (USA, 2009). This statute determined that the U.S. NBP should seek to ensure every American has access to broadband capability, and should include a detailed strategy for achieving affordability and maximizing use of broadband.

The U.S. NBP contains over 200 recommendations for FCC, the Executive Branch, Congress and state and local governments, which are grouped in four categories: a) establishing competition policies; b) ensuring efficient allocation and use of government-owned and government-influenced assets;[7] c) creating incentives for universal availability and adoption of broadband; and d) updating policies, setting standards and aligning incentives to maximize use for national priorities.

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[6] Acronym for "Programa Nacional de Banda Larga."

[7] These are assets controlled or influenced by the government, such as spectrum, poles and rights-of-way (FCC, 2010).

1.3 <u>Benchmarking of National Broadband Plans</u>

The benchmarking of national broadband plans, despite differences in economy, culture, development, and legal and regulatory frameworks of each country, may reveal good practices, indicate possible improvements, uncover points that should be addressed, or show adherence to effective strategies. Also, it can bring light to different approaches on how to solve common problems and help in the identification of inefficient policies.

An example is a report from U.S. Government Accountability Office (GAO) that addressed actions taken by selected countries that ranked better than the United States in broadband deployment and adoption rates, as well as how recommendations in the U.S. NBP align with the selected countries' actions (GAO, 2010a). According to this report, United States achieved a 95% broadband deployment rate and a very high adoption rate (26.4 subscribers per 100 inhabitants), but moved lower in international rankings as other developed countries began the implementation of their NBPs. Thus, the actions of those countries offered "examples that could inform future U.S. broadband policy decisions."

In that sense, GAO selected seven countries (Canada, France, Japan, the Netherlands, South Korea, Sweden and the United Kingdom) and analyzed "relevant policies, plans, and guidance issued by responsible government agencies, regulatory authorities, and broadband providers" and actions taken by governments and other stakeholders. GAO identified five common categories of actions:

> *"(1) establish plans and policies to guide deployment and provide leadership support, (2) provide government funding through public/private partnerships,(3) promote competition, (4) implement strategies to make broadband services more available and useful to consumers, and (5) provide digital literacy training and consumer subsidies."* (GAO, 2010a, p. 20)

GAO concluded that the four categories of recommendations presented in the U.S. NBP (establishing competition policies; ensuring efficient allocation and use of government-owned and government-influenced assets; creating incentives for universal availability and adoption of broadband; and updating policies, setting standards and

aligning incentives to maximize use for national priorities) represented an approach to expanding broadband deployment and adoption similar to the five categories of actions identified in the compared plans. Table 2 shows the results obtained by GAO from the comparison of both sets of actions and recommendations:

Table 2: Comparison of the actions proposed by the selected countries' NBPs with the actions recommended by the U.S. NBP

Action taken by some or all of the selected countries	U.S. NBP action area/recommendation
Establish plans and policies to guide deployment and provide leadership support	Adopt strategies and long-term goals, take actions to measure effects over time, and ensure leadership commitment through the establishment of an interagency council accountable for implementing the plan's recommendations.
Provide government funding through public/private partnerships	Manage government assets, such as rights of way, to encourage network upgrades. Use Universal Service Funds as well as other government funds to help subsidize deployment in high-cost areas.
Promote competition	Design policies to ensure robust competition.
Implement strategies to make broadband services more available and useful to consumers	Maximize the benefits of broadband in sectors the government influences significantly, such as education, health care, and government operations.
Provide digital literacy training and consumer subsidies	Use government funds to help support efforts to boost adoption and use and subsidize adoption among low-income groups.

Source: GAO (2010a).

Finally, GAO stated that the implementation of the U.S. NBP would be challenging, even though its recommendations are similar to those of the leading countries in broadband deployment and adoption, because it would require actions by governments in federal, state and local levels and by the private sector, coordination among multiple stakeholders and sufficient funding.[8]

Also on the analysis of broadband strategies adopted by different countries, Kim, Kelly and Raja (2010) studied policies and regulations deployed by leading countries, with a focus in the Republic of Korea and case studies covering Finland, France, Japan, Sweden, the United Kingdom, and the United States. They found that these policies and regulations were focused on building supply and demand for broadband, and organized them in a list considering a broadband ecosystem that is integrated by networks, services, applications and users, and a logical sequence for broadband market development comprising promotion, oversight and universalization. Their results are reproduced in Table 3:

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[8] The report shows that in the seven countries analyzed, governments have provided funding, such as grants and loans, to help the deployment of broadband networks in unattractive areas, and the same strategy was proposed by the U.S. NBP. However, the American plan does not explicitly recommend the use of public-private partnerships to help fund broadband deployment, even though this mechanism has been adopted by all of the seven countries and it helps "maximize government resources and minimize risk for the private investors." (GAO, 2010a)

Table 3: List of policies and regulations for broadband market development

	Early stage: Promote	*Mass market: Oversee*	*Universal service: Universalize*
Goal	*Focus on promotional policies as a pump-primer to spread broadband networks*	*Facilitate competition through consistent, facilitating regulation*	*Universalize broadband service as the market grows*
Networks	- Develop an enabling environment through policies and regulation that promote investment and market entry - Reduce administrative burdens and provide incentives and subsidies for R&D, pilots, and network rollout - Develop cyber-building certification systems - Allocate and assign spectrum for wireless broadband services	- Consider infrastructure sharing, including unbundling of the local loop - Reallocate spectrum to expand available bandwidth	- Undertake deployment of open access to broadband networks in rural or remote areas, using public/private partnerships, as appropriate - Coordinate access to rights-of-way
Services	- Provide broadband networks to schools, government agencies, etc (government as an anchor tenant) - Standardize and monitor service quality	- Create an enabling environment for intra- and intermodal competition - Ensure non-discriminatory access for service, application, and content providers	- Consider expanding universal service obligation to include broadband
Applications	- Promote government-led demand aggregation - Government agencies as early adopters and innovators - Provide e-government and e-learning applications - Promote creation of digital content - Develop local content and hardware sector	- Support secure, private, reliable e-commerce transactions - Introduce intellectual property protections	- Develop advanced e-government programs - Offer grants to community champions and broadband demand aggregators
Users	- Provide low-cost computers and other user devices, such as in education - Deliver digital literacy programs	- Promote ethics on information use	- Expand universal service programs to underserved communities - Construct community access centers - Provide subsidies for poor households to buy user devices (such as computers)

Source: Kim, Kelly and Raja (2010).

Both studies show that policies and actions towards increasing broadband deployment and adoption are similar among leading countries. They are focused not only in stimulating the construction of infrastructure, but also in fomenting competition, promoting services and applications, and educating the users.

1.4 <u>Outline of this study</u>

The purpose of this research paper is to describe the discussion process, policies, actions and goals of the PNBL, and to perform a comparative review with the discussion process and recommendations of the U.S. National Broadband Plan.

The second section of the paper presents the PNBL. At the beginning, a brief history of telecommunications policy and regulation in Brazil will be presented as well as some aspects of the current Brazilian telecommunications regulatory framework. The objective of these descriptions is to help the comprehension of the Brazilian legal and regulatory framework related to digital inclusion and broadband policies, as well as the role of Telebras and how fixed telephony concession contracts were designed, which affected some of the choices made by the Brazilian government in the development of its broadband plan. Next, the government actions on ICT and broadband infrastructure prior to the PNBL will be described, as well as the development process of the Brazilian broadband plan. Later, the PNBL and related actions will be presented.

The third section deals with the U.S. National Broadband Plan. It will briefly present telecommunications regulation and broadband policies in the United States, focusing on the agencies responsible for implementing them. Following, the U.S. NBP discussion process and recommendations will be described.

The fourth section performs the review of the PNBL in light of the U.S. NBP. As Brazil and the United States differ on their current levels of broadband penetration and adoption, as well as economic and technological development, and even culture and political thoughts, this analysis will not compare each individual NBP action and its pretended outcomes. It will rather concentrate on three factors that may affect the effectiveness of a NBP, whichever are the strategies proposed:

a) the discussion process and development of both plans, in order to assess whether the proposed policies and actions considered the opinions and suggestions of all interested parties and stakeholders;

b) the structure of the plans, so as to evaluate whether they actually present a real planning of broadband policies, with well defined actions and goals; and

c) the focus of the plans, to determine whether their actions aim at broadband supply or broadband demand, or both supply and demand, which may prevent a future gap between penetration and adoption rates.

2. THE BRAZILIAN NATIONAL BROADBAND PLAN

2.1 Brief history of the telecommunications sector in Brazil, 1960s-2008

Until the 1960s in Brazil, telecommunications services could be offered directly by the federal government, states or municipalities or by firms under concession. There were a large number of operators, over 1,200, most of them owned by private foreign companies, without any kind of coordination or integration between their networks. The costs were high, the quality was deplorable and interconnection was a very difficult challenge to overcome. There was also a deficit of telephone lines, technological discrepancy from other countries, and very high service rates. Brazil was amongst the countries with lowest telephone density (PEREIRA FILHO, 2002).

In 1962, the federal government enacted Law nr 4.117, known as Brazilian Telecommunications Code (CBT),[9] (BRAZIL, 1962). Its main purpose was to create a legal framework for the ordered development of telephony services. CBT established the National Telecommunications System (SNT),[10] to be integrated by all telecommunications networks, and created the National Telecommunications Council (CONTEL),[11] responsible for planning the SNT and for the technical regulation of the telecommunications sector.

CBT also established a federal government monopoly on long distance telephony, and authorized the creation of a government-owned company to operate the SNT trunks. States and municipalities would operate local telephony, directly or under concession, and were subject to supervision by CONTEL. Later, the attribution of directly exploring telecommunications services or conceding them to private companies was completely transferred to the federal government under Decree-Law nr 162 (BRAZIL, 1967a).

In 1965, the federal government created the state-owned company Embratel, responsible for operating long distance telecommunications services and managing the

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[9] Acronym for "Código Brasileiro de Telecomunicações".
[10] Acronym for "Sistema Nacional de Telecomunicações".
[11] Acronym for "Conselho Nacional de Telecomunicações".

SNT trunks. In 1967, Decree-Law nr 200 created the Ministry of Communications, which encompassed CONTEL and Embratel (BRAZIL, 1967b).

However, the quality of local service remained unsatisfactory, the expansion of telecommunications infrastructure was slow and there was a lack of investment on network improvement. In 1972, the federal government enacted Law nr 5.792, which established a new policy on the operation of telecommunications services and authorized the creation of a state-owned company named Telebras, to be supervised by the Ministry of Communications (BRAZIL, 1972).

The main attributions of Telebras were: to plan the telecommunications public services, in accordance to directives issued by the Ministry of Communications; to manage federal government shares in telecommunications operators; to assist telecommunications operators in order to reduce operational costs; to eliminate unnecessary redundancies and to increase productivity; to foster investment to be applied on the execution of Ministry-approved plans and projects; to foster the implementation and operation of telecommunications services, at home or abroad, through subsidiary or associate companies; to foster training of technical personnel; and to perform other related activities as ordered by the Ministry of Communications.

Under the provisions of Law nr 5.792 and Decree nr 74.379 (BRAZIL, 1974), Telebras assumed control of existent private operators and consolidated federal government monopoly on local telephony. Telebras acted as a holding company, controlling 27 local telephony operators, one per state, and a long distance telephony and data communications operator, Embratel. Four independent companies remained: CRT (controlled by Rio Grande do Sul state), SERCOMTEL (controlled by Londrina municipality), CETERP (controlled by Ribeirão Preto municipality) and CTBC Telecom (private owned). [12]

From 1972 to 1988, the telephone density increased from 1.9 to 6.1 fixed lines per inhabitant (TELEBRASIL, 2004). The Telebras system had control over 95% of

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[12]CTBC Telecom is an acronym for Companhia de Telefone do Brasil Central. There was another telephone company named CTBC – Companhia Telefônica da Borda do Campo, which was state-owned and a part of the Telebras system.

telephone lines and launched communications satellites that integrated the whole country (TCU, 1997). Especially during the 1970s, the expansion of telecommunications networks managed by Telebras was impressive.

Nevertheless, the economic crisis in Brazil during the 1980s halted the investment in telecommunications infrastructure, and the Telebras system was unable to meet the growth of demand for services. Moreover, the federal government kept telecommunications service rates below their costs as an instrument for control of inflation, and practiced cross subsidy between different services, which created disincentives for new investment.

The Brazilian Constitution of 1988 (BRAZIL, 1988), in its original text, maintained the federal government monopoly on telecommunications services. It stated in Article 21, XI, that the Union (federal government):

> *"shall have power to operate, directly or through concession to companies with the majority of voting shares under state control, the telephone, telegraph and data transmission services as well as other public telecommunications services, provided that information services may be rendered by private legal entities through the public telecommunications network operated by the Union."*

However, the state monopoly model for the telecommunications sector could no longer stand, for the federal government could not support the investment needed to match the demand for services. In that sense, Brazilian President Fernando Henrique Cardoso, who took office in 1995, proposed a new organization of the telecommunications industry, in accordance to these guidelines:

> *"- stimulate private sector investments;*
> *- strengthen the role of the State as the regulatory agency for telecommunications;*
> *- diversify the supply of private sector services in industry;*
> *- preserve the public sector presence in strategic telecommunications and technological development and,*
> *- create tariff and fiscal mechanisms that will enable the transfer of resources from higher profitability markets to those with lower profitability potential."* (FONSECA, 1996, p. 12)

Following those guidelines, the federal government proposed and the Brazilian Congress passed Constitutional Amendment nr 8 (BRAZIL, 1995), which ended the state monopoly on telecommunications services. It allowed the concession of telecommunications services to private companies and demanded for the creation of a telecommunications regulatory authority, as stated by Article 21, XI, of the Brazilian Constitution of 1988, as amended:

> *"The Union shall have power to operate, directly or through authorization, concession or permission, the telecommunications services, as set forth by law, which law shall provide for the organization of the services, the establishment of a regulatory agency and other institutional issues."*

The first step to implement the opening of the telecommunications market was the enactment of Law nr 9.295 (BRAZIL, 1996), which allowed the concession of mobile telephony and communications satellite operation to private companies.

Later, the Brazilian Congress passed Law nr 9.472 (BRAZIL, 1997), known as the General Telecommunications Law (LGT),[13] which established a new regulatory framework and created the National Telecommunications Agency (Anatel).[14] It allowed the concession of fixed telephony to private companies and authorized the privatization of the Telebras system. The federal government would no longer operate telecommunications services, retaining only regulatory functions.

The privatization of state-owned operators followed the provisions of LGT and Decree nr 2.534 (BRAZIL, 1998a), known as General Concessions Plan (PGO).[15] For the fixed telephony services, it was established that the 27 local service operators would be grouped in three concession areas. A fourth area encompassed the concession of long distance telephony in the whole country.

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[13] Acronym for "Lei Geral de Telecomunicações".
[14] Acronym for "Agência Nacional de Telecomunicações".
[15] Acronym for "Plano Geral de Outorgas".

The auctioning of the Telebras system happened on July 29, 1998, and was audited by the Brazilian Court of Audit.[16] (TCU, 2002) As a result, three incumbent local fixed telephony private concessionaires emerged: Telesp, later renamed Telefonica, covering the state of São Paulo; Tele Centro Sul, later renamed Brasil Telecom, covering the South and Central regions of Brazil; and Tele Norte Leste, later renamed Oi, covering the North and East regions of the country. Mobile telephony operators and Embratel, as the long distance telephony concessionaire, were separately privatized. CTBC and Sercomtel, which were already independent from the Telebras system, also became fixed telephony concessionaires, although their operation areas were much smaller.

Under the Fixed Telephony Concession Contracts signed in 1998 (an example is ANATEL, 1998), the concession term would end on December 31, 2005, and could be renewed for 20 years, if the conditions of the contract were regularly implemented by the concessionaire. The incumbent operators assumed obligations related to the universalization of fixed telephony, which were described in a document approved by the Brazilian President named General Plan of Universalization Goals (PGMU).[17] Also, the concessionaires were forbidden to provide cable TV.

Other telecommunications services, including mobile telephony and data transmission, were not subject to universalization obligations,[18] neither were contracted through concession, but through service authorizations that implied lesser state regulation, in accordance to LGT.[19]

The 1st PGMU was approved by Decree nr 2.592 (BRAZIL, 1998b). It established universalization goals to be implemented until December 31, 2005. Most of the goals were related to bringing telephony access to individuals (individual phone line subscriptions) and installing public phones (payphones), and were focused on building

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[16] Brazilian Court of Audit (TCU, acronym for "Tribunal de Contas da União") is the supreme audit institution of Brazil and a part of the Brazilian Legislative Branch, as provided by Article 71 of the Brazilian Constitution of 1988.

[17] Acronym for "Plano Geral de Metas de Universalização".

[18] When LGT was signed into law, it was a political choice to guarantee the universal and continuous access to fixed telephony through highly regulated concessionaires, due to its economic and social importance by that time, and to let a freer market develop mobile telephony and data networks, which had very low deployment rates and very high prices.

[19] Refer to section 2.2 for a detailed explanation on telecommunications services regimes.

fixed telephony infrastructure in unattractive areas, such as remote, rural or small villages. This plan was concerned on guaranteeing access to fixed telephony for most of the Brazilian population.

In 2000, the federal government enacted Law nr 9.998 (BRAZIL, 2000), which created the Telecommunications Services Universalization Fund (FUST).[20] FUST has the objective of covering concessionaires costs, incurred solely in the implementation of universalization goals, that cannot be recovered through efficient service operation. Although this fund has collected over 5 billion dollars since 2000, few resources were used because of operational and legal difficulties faced by the federal government, as shown by the Brazilian Court of Audit in a performance audit on this subject.[21] (TCU, 2005)

The fixed telephony concessions were renewed for 20 years on 2006, with the signature of new Concession Contracts (an example is ANATEL, 2006). Clause 3.2 of the Concession Contract stated that it shall be altered on December 31, 2010, December 31, 2015, and December 31, 2020, in order to establish new conditions, new universalization goals and new quality goals, according to the conditions of its time.

Also, a new General Plan of Universalization Goals (2nd PGMU) became effective on January 1, 2006, in accordance to Decree nr 4.769 (BRAZIL, 2003b). Like the first plan, it defined goals related to individual and public fixed phones, including time limits for the attendance of consumer requests for line activation. It also introduced new goals, including the implementation of Telecommunications Service Stations for collective use (PST).[22] The PST was to be constituted of, at least, one payphone and one public access terminal for dial-up Internet connection, and should have been installed in several urban and rural localities determined by the plan.

In 2008, the federal government altered the General Concessions Plan through Decree nr 6.654 (BRAZIL, 2008b), in order to allow the merger of a maximum of two

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[20] Acronym for "Fundo de Universalização dos Serviços de Telecomunicações".
[21] Refer to section 2.3 for a detailed explanation on the lack of use of FUST and the audit report by TCU.
[22] Acronym for "Posto de Serviço de Telecomunicações".

concessionaires, which was forbidden by that time. As a result, concessionaires Oi and Brasil Telecom merged, creating the largest telephone operator in the country.

Besides fixed telephony services, concessionaires have also been providing Internet connection services using its wired network through xDSL technologies. [23] As of 2008, Brazil had 10 million fixed broadband lines in operation, out of which 63.7% were provided by concessionaires Oi and Telefonica (TELEBRASIL, 2011).

This number of broadband lines represented an extremely low adoption rate of broadband services by the Brazilian population, if compared to the number of installed fixed telephone lines (57.9 million) and of mobile phones (150.6 million) in the same year (TELEBRASIL, 2011).

Although the concessionaires had been using their wired networks for the provision of broadband services, it is not part of the Concession Contract and, therefore, broadband is not subject to universalization goals, which are restricted to fixed telephony. As a consequence, the concessionaires invested for bringing broadband capability to their networks only in highly attractive areas, and also charged service fees that were prohibitive for the large Brazilian low income population.

This gap in broadband deployment raised concerns in the federal government, which already had implemented some digital inclusion programs since the beginning of the 2000s. Section 2.2 of this study presents the current Brazilian telecommunications regulatory framework, which is important for understanding the options chosen and the challenges faced by the government in its broadband initiatives. Section 2.3 briefly presents the previous digital inclusion programs, as well as the actions undertaken by the federal government between 2008, when it decided to act more intensively in stimulating broadband deployment, and 2009, when the first draft of a national broadband plan was released.

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[23] According to Bhagavath and O'Neil (2002), xDSL is a reference for the several forms of the Digital Subscriber Line protocol, which have "the common feature of operating at high bit rates and with a high reliability over existing twisted pair copper lines. xDSL makes full use of the copper line frequency spectrum of approximately 2 MHz, it uses advanced modulation and coding methods, and it works simultaneously with the plain old telephone system (POTS) on the same copper line."

2.2 Current Brazilian telecommunications regulatory framework

The Brazilian telecommunications regulatory framework is ruled by the Brazilian Constitution of 1988 and the General Telecommunications Law, and by other federal laws and regulations related to government organization and public administration.

These legal texts indicate that the Executive Branch, and specifically the Ministry of Communications,[24] shall formulate public policies for the telecommunications sector, and Anatel shall implement those policies (CUNHA, 2011). States and municipalities cannot issue policies or regulations on the provision of telecommunications services.[25]

Under the provisions of the General Telecommunications Law, telecommunications services shall be provided under "public regime" or "private regime". Telecommunications services provided under public regime are operated by concessionaires,[26] are subject to continuity,[27] and universalization obligations,[28] and have service rates controlled by Anatel. Only telecommunications services that the federal government decides to guarantee their existence, universalization and continuity may be provided under public regime, which implies that the government may take over a concession if the concessionaire fails to meet contractual clauses and obligations or specific service regulations.

The concessionaires shall be selected by auction, which, for the first concession term started in 1998, coincided with the privatization auction. Telecommunications services provided under public regime are subject to fixed concession terms of up to 20

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[24] In Brazil, the Ministry of Communications reports directly to the President of the Republic. However, the Chief of Staff of the Presidency holds some coordinating power on ministries' policies and actions.

[25] Several decisions from the Brazilian Supreme Court ("Supremo Tribunal Federal" in Portuguese) affirmed this and declared the unconstitutionality of state and municipal laws that tried to regulate aspects of the provision of telecommunications services, like the imposition of new contractual obligations and the reduction of service rates. Some examples are: ADI 4.649-MC, judged in September 28, 2001; ADI 3.343, judged in September 1, 2011; ADI 4.533-MC, judged August 25, 2011; ADI 3.558, judged in March 17, 2011; ADI 4.083, judged November 25, 2010; these decisions can be consulted in the Supreme Court website, <www.stf.jus.br>, in Portuguese.

[26] Concessionaires may be government-owned companies or private firms.

[27] According to LGT, continuity obligations shall guarantee constant availability of adequate telecommunications services for costumers, without unjustified interruptions.

[28] According to LGT, universalization obligations shall guarantee that any person or institution has access to telecommunications services, regardless of localization or socio-economic condition, and shall guarantee the use of telecommunications in the provision of essential public interest services. These obligations are defined by the General Plan of Universalization Goals.

years, renewable for the same time period, and by the end of the concession term the concessionaire's assets that are essential for service provision must be handed over to the federal government, [29] which may perform another auction to select a new concessionaire.

Currently, fixed telephony is the only telecommunications service provided under public regime.

All other services are provided under private regime by authorized operators, and are not subject to continuity and universalization obligations, but must attend specific Anatel regulations.

Authorizations are valid for unlimited time and distributed freely to any operator that meets the requirements of the law, unless the service can only be provided with the use of radiofrequencies. In that case, the operator shall acquire a limited-time authorization for use of radiofrequencies through a spectrum auction conducted by Anatel. The spectrum authorization term may last up to 20 years, and may be renewed for the same time period.

Mobile telephony, pay TV, [30] data transmission and Internet access are telecommunications services provided under private regime, even if the provider is a fixed telephony concessionaire and uses its wired network. Fixed telephony may also be provided under private regime by authorized operators, in order to stimulate competition between incumbents and new entrants.

The General Telecommunications Law states that the President, through decree, shall institute or eliminate the provision of telecommunications services under public regime and shall approve the General Concessions Plan and the General Plan of Universalization Goals for telecommunications services provided under public regime. However, these acts shall be drafted by Anatel, after public consultation.

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[29] LGT refers to these as "reversible assets".

[30] In Brazil, pay TV is considered a telecommunications service provided under private regime and it is regulated by Anatel. However, under the provisions of the Brazilian Constitution of 1988, open air TV and radio are considered broadcasting services apart from telecommunications services, and they are regulated by the Ministry of Communications, not by Anatel.

Moreover, Anatel must implement the "telecommunications national policy" issued by the Ministry of Communications. Anatel shall also enact regulations referring to the concession and provision of telecommunications services, as well as enforce them through oversight and application of penalties. Furthermore, Anatel is responsible for signing Concession Contracts and Authorizations and for enforcing their provisions.

Telecommunications policymaking shall observe the objectives and directives indicated by Decree nr 4.733 (BRAZIL, 2003a). It emphasizes that telecommunications policies shall be aimed at meeting citizen's needs, and it lists general objectives to be pursued in the policymaking process, which are reproduced in Table 4:

Table 4: Objectives for telecommunications policymaking in Brazil

- social inclusion; - universalization; - effective contribution for the optimization and modernization of government programs and of public services; - integration of telecommunications policies to other sectors essential to the promotion of economic and social development of Brazil; - stimulus to industrial development; - fostering of research and technical development; - assurance of appropriate costumer care in the provision of telecommunications services; - stimulus to job creation and manpower training; and - stimulus to free and fair competition among telecommunications service providers in order to promote the diversity of services and lower prices.

Source: BRAZIL (2003a).

Decree nr 4.733 also stated that the Ministry of Communications shall formulate and propose policies, directives, objectives and goals, as well as coordinate project implementation and actions related to digital inclusion, aiming at the objectives reproduced in Table 5:

Table 5: Objectives for policymaking by the Ministry of Communications

- to guarantee Internet access to all citizens; - to meet the needs of rural population; - to stimulate the development of services so as to provide telecommunications services to the entire Brazilian population, with fair and reasonable prices and rates; - to promote the development of new models for the definition and readjustment of service rates, that guarantee a fair relation between service costs and revenues, and respect the financial equilibrium of contracts; - to guarantee appropriate treatment to the needs of the citizens related to the quality of telecommunications services; - to organize telecommunications services aiming at social inclusion.

Source: BRAZIL (2003a).

Therefore, digital inclusion and ICT have been a concern of the Brazilian telecommunications policymaking in recent years. However, the current regulatory framework is still highly focused in fixed telephony and misses the emergence and importance of new technologies and communications tools. As a consequence, the

government has been facing challenges in the formulation and implementation of policies to universalize broadband, like the impossibility of using FUST resources, because broadband is not a service provided under public regime.

2.3 Government actions on ICT and broadband infrastructure prior to the PNBL

Prior to discussing the creation of a national broadband plan, the Brazilian federal government had a number of sparse projects and initiatives for digital inclusion, which were aimed mostly at fostering the use of ICT by the low-income population and the construction of broadband networks in unattractive areas.

In 2000, Law nr 9.998 (BRAZIL, 2000), which created FUST, established as some of the objectives for this funding the diffusion of Internet access networks, even though, by that time and until now, the use of FUST was limited to fixed telephony concession contracts. These objectives were:

a) implementation of subsidized access to digital information networks, including Internet, for health institutions;

b) implementation of subsidized access to digital information networks, including Internet, for schools and libraries, including costumer premises equipments;

c) reduction of service rates paid by schools and libraries for use of those networks, so as to reach the poor population;

d) implementation of high speed networks in schools and libraries.

However, the federal government never managed to use FUST resources on programs that would address those objectives. A report from TCU (2005) showed that some of the main reasons for this were: lack of coordination mechanisms for actions of different responsible government agencies (e.g., Ministry of Communications, Ministry of Health, Ministry of Education); lack of policy priorities and goals and lack of studies and cost-benefit analysis that should have been performed by the Ministry of Communications; and lack of coordination between the Ministry of Communications and Anatel, which was responsible for spending FUST resources and for proposing new telecommunications services, besides fixed telephony, that could use those funds.

In fact, by that time many digital inclusion programs existed in different ministries, according to the area to be addressed, but there was no government institution responsible for integrating and coordinating them. Table 6 reproduces a list from the TCU report that shows the most important digital inclusion programs by 2005:

Table 6: List of the most important digital inclusion programs in Brazil as of 2005

Digital inclusion program	Coordinating ministry/agency	Description
GESAC	Ministry of Communications	Supplies Internet connection to several population segments, most of them defined by other ministries (e.g., Education, Defense, Culture, Social Development).
PROINFO	Ministry of Education	Fosters the use of ICT as an educational tool in elementary schools.
Casa Brasil (Brazil House)	Ministry of Science and Technology, Presidency Chief of Staff	Supplies Internet connection to low-income communities through Telecenters.[31]
Cidadão Conectado – Computador para Todos (Connected Citizen – Computer for all)	Presidency	Subsidizes the purchase of microcomputers with Internet access.
Ponto de Cultura (Culture Place)	Ministry of Culture	Rooms with Internet access that integrate different cultural activities.
Telecentro de Informação e Negócios (Information and Business Telecenter)	Ministry of Development, Industry and Trade	Telecenters that offer Internet access for small enterprises.

Source: TCU (2005).

Although these digital inclusion programs presented issues to be addressed in order to achieve higher efficiency, like those revealed by the TCU report, they show once again that the Brazilian government recognized the importance of ICT and broadband as drivers for social and economic development. An example of this is the GESAC program, [32] created in 2002 and still active, which is coordinated by the Ministry of Communications and supplies, through partner entities, satellite and terrestrial Internet connection to telecenters, in order to promote digital inclusion in the whole Brazilian territory. It is focused on localities that are not served by fixed telephony infrastructure or are difficult to reach (MC, 2011a).

GESAC provides Internet connection mainly through satellite technologies, with download speed of at least 512 kbit/s and upload speed of at least 128 kbit/s, and network services aimed at digital inclusion. The equipment is installed in a telecenter, which is administered by the partner entity, and must serve the general public at least 8 hours per weekday, offering free Internet access. The equipment provider is contracted by the Ministry of Communications through a bidding process. GESAC infrastructure

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[31] Telecenter was defined by Mukerji (2008) as a generic term for "all kinds of arrangements that seek to provide shared and mediated access to information and services by using new technologies especially computers and Internet."

[32] Acronym for "Governo Eletrônico Serviço de Atendimento ao Cidadão", in Portuguese, which translates to "Electronic Government, Citizen Care Service."

may also be used by other digital inclusion programs, such as Casa Brasil and Ponto de Cultura.

The government concern with reaching unattractive areas with broadband infrastructure has also driven the modeling of the 3G spectrum auction, which was performed by Anatel in 2007. The notice for auction (ANATEL, 2007) determined that licensees would be obligated to meet certain coverage goals,[33] which included the deployment of 2G cellular networks in all 5,565 Brazilian municipalities in a maximum of two years; and the deployment of 3G wireless broadband networks in 3,387 municipalities in a maximum of eight years (maximum of two years for state capitals, municipalities with more than 500,000 inhabitants and the Federal District).

However, these actions were still insufficient to assure a broad coverage of either fixed or wireless broadband networks in most of the Brazilian municipalities. To induce a more significant deployment of broadband over the country, and considering the large broadband market share held by fixed telephony concessionaires, the government decided to change the universalization goals defined by the 2nd PGMU, in order to include an obligation for the construction of broadband infrastructure.

In that sense, Decree nr 6.424 (BRAZIL, 2008a) altered the 2nd PGMU, so as to remove the obligation of installing PST in urban areas and to add the obligation of building a "backhaul." Backhaul is defined by Decree nr 6.424 as a fixed telephony support network for broadband connection, that links access networks to the operator backbone. It was this definition, asserting that the backhaul belongs to the fixed telephony network, which made possible the inclusion of broadband goals in the PGMU.[34] The final goal was that all Brazilian municipal seats and 3,000 other localities would be reached by backhaul infrastructure until December 2010.

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[33] The estimated cost of coverage goals was discounted from the minimum bidding price of the 3G spectrum auction, as shown by TCU (2008). Yet, the auction achieved an average premium of 86.67%, which compensated the discounted cost of coverage goals.

[34] The inclusion of the backhaul goals in the 2nd PGMU was highly controversial at the time. There were doubts on the legality of considering broadband infrastructure part of the fixed telephony universalization goals, and also on whether the broadband infrastructure built to meet those goals would be a 'reversible asset'. The consulting board of Anatel held discussions on these issues, one of which this author participated (ANATEL, 2009a). TCU analyzed a complaint on the inclusion of backhaul goals and concluded that it was legal (TCU, 2010). Also, concessionaires signed an amendment to the concession contracts in order to clearly state that the backhaul infrastructure that had been built in order to meet universalization goals was a 'reversible asset' (ANATEL, 2009b).

After negotiations with the federal government, the concessionaires agreed with the change of universalization goals and signed amendments to the concession contracts (ANATEL, 2008a). They also agreed to participate in a program called "Broadband in Schools," [35] and signed amendments to their Multimedia Communication Service authorization terms, [36] that obligated them to comply with the program (ANATEL, 2008b).

The Broadband in Schools program, which is still active, had the objective of deploying broadband to all urban area public schools in Brazil. The concessionaires had the obligation to connect all schools until the end of 2010, and the obligation to provide Internet access to these schools until the end of 2025, free of charge. As of the end of 2010, 57,600 schools have been served by the program (ANATEL, 2011a).

Also in 2008 the Ministry of Communications issued Rule nr 178 (MC, 2008), which established guidelines to be followed by Anatel in the implementation of telecommunications policies, many of them related to broadband diffusion. Table 7 presents the guidelines that were associated with broadband:

Table 7: Guidelines defined by Ministry of Communications Rule nr 178 related to broadband

- increase the supply of broadband subscriptions.
- decrease barriers to access and use of telecommunications services to the low-income population.
- foster the diversification of telecommunications services supply, expanding the convergence process and the multimedia applications availability.
- increase the supply of all collective interest telecommunications services, in all the regions of the country.
- increase the coverage and the capacity of broadband networks.
- increase the supply of broadband services through multiple networks and services.
- increase the supply of telecommunications services in rural areas, assuring specific supply for this market, in all the regions of the country.
- guarantee competition in services provision, in order to benefit users in quality and prices.
- create favorable condition for the emergence and strengthening of small and medium service providers.
- establish a competition model that encourages network sharing, between different services and providers, as well as multiple options to the user.

Source: MC (2008)

In compliance with the Ministry of Communications rule, Anatel released a plan with short-term, medium-term and long-term actions to revise its regulations in the following years. Called General Plan for the Update of Telecommunications

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[35] Translation of "Banda Larga nas Escolas", in Portuguese.

[36] In order to provide Internet access, which is a service provided under private regime and not a part of the fixed telephony concession contract, the concessionaires also had authorizations for the so-called Multimedia Communication Service – SCM (acronym for "Serviço de Comunicação Multimídia", in Portuguese).

Regulations in Brazil (PGR),[37] (ANATEL, 2008c) it stated as one of its objectives the "massification" of broadband. Table 8 presents some of the actions related to broadband:

Table 8: Actions defined by PGR related to broadband to be undertaken by Anatel

Short-term actions (to be undertaken in two years)
- Availability of spectrum for the massification of broadband, for it to be supplied by new operators and new technologies.
- Formulation of the General Plan of Competition Goals (PGMC),[38] which will stimulate competition and services supply.
- Revision of the General Plan of Universalization Goals (PGMU), to include new goals related to the expansion of broadband networks.
- Regulation of significant market power, which will allow the use of asymmetric measures so as to bring efficiency to supplied services.
- Regulation of unbundling, which will stimulate the use of broadband networks by providers.
- Implementation of the cost model for telecommunications services, including broadband, which will help Anatel in its decision-making processes.
Medium-term actions (to be undertaken in five years)
- Allow the supply of specific broadband subscription plans, including plans for the low-income population.
- Regulation of the Multimedia Communication Service, considering technological convergence and mobility.
- Regulation of network neutrality.
- New model for intercarrier compensation.
Long-term actions (to be undertaken in ten years)
- Regulation of a convergent model for telecommunications services authorizations.
- Revision of FUST regulation.
- Study issues related to the use of the digital dividend, after the transition of analog to digital TV is completed.

Source: ANATEL (2008c)

Anatel has been tracking the implementation of PGR actions (ANATEL, 2011b). As of December 2011, Anatel considered that some of the short-term actions have been implemented, e.g., the distribution of additional spectrum to 4G wireless broadband services, yet to be auctioned, and the auction of more 3G spectrum, the enactment of the 3rd PGMU,[39] and the implementation of a new cost model for telecommunications services.[40] The remaining actions are still under discussion in the technical bureaus of Anatel or in its board of commissioners.

Another important action related to digital inclusion and broadband was taken by the federal government in 2009. Decree nr 6.948 (BRAZIL, 2009) created an interministerial committee, called Steering Committee of the Digital Inclusion Program (CGPID),[41] to coordinate the ICT and digital inclusion policies that were spread over different ministries. The powers listed in Table 9 were granted to this committee.

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[37] Acronym for "Plano Geral de Atualização da Regulamentação das Telecomunicações no Brasil".

[38] Acronym for "Plano Geral de Metas de Competição".

[39] The 3rd PGMU will be discussed in Section 2.4.

[40] Although Anatel considers that the action was implemented, it has only signed a contract, in August 2011, with a consultant group that will develop the cost model. So, the cost model itself is yet to be implemented.

[41] Acronym for "Comitê Gestor do Programa de Inclusão Digital".

Table 9: Powers granted to CGPID by Decree nr 6.948

- establish general guidelines for the management and expenditure of funds for the Digital Inclusion Program, created by Law nr 11.196/2005,[42] and its projects. - approve the annual work plan of the Digital Inclusion Program and periodically evaluate its results. - track and monitor the implementation and the performance of projects within the Digital Inclusion Program. - link up with other steering committees and interministerial working groups, established in the federal government, states, Federal District and municipalities, with specific objectives related to digital inclusion programs and projects. - prepare studies and proposals related to projects within the Digital Inclusion Program, in order to support decisions under the Presidency of the Republic regarding projects and programs of digital inclusion. - assist and advise organs of the Presidency of the Republic on issues related to programs and projects of digital inclusion and their monitoring.

Source: BRAZIL (2009)

This coordinating instance was headed by the Chief of Staff of the Presidency ("Casa Civil," in Portuguese) and included representatives from the following ministries: Personal Office of the President; Secretariat of Social Communication of the Presidency; Ministry of Communications; Ministry of Science and Technology; Ministry of Education; Ministry of Culture; Ministry of Planning, Budget and Management.[43]

As a focal point for debating digital inclusion policies, the CGPID participated extensively in the formulation of the actions of the Brazilian broadband plan, which will be presented in Section 2.4.

2.4 The Brazilian Broadband Plan: discussion process, actions and goals

In 2009, debates on the necessity of instituting a Brazilian broadband plan were already being held. TELEBRASIL, an association of telecommunications operators, hosted in August 2009 a seminar to discuss the enactment of an NBP, which was attended by many stakeholders and government officials, including representatives from the Ministry of Communications, Anatel and the Presidency.

In their presentations, representatives from the Ministry of Communications and from the Presidency announced that the federal government would propose a broadband plan, and talked about some of the issues that would be addressed, like regulation, investment, financing and taxation (TELEBRASIL, 2009).

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[42] Law nr 11.196 (BRAZIL, 2005) created a differentiated tax regime for stimulating technological research and development. It also reduced taxes on data transmission equipment, under the title of a "Digital Inclusion Program."

[43] The Secretariat of Strategic Affairs of the Presidency, the Ministry of Development, Industry and Trade, the Ministry of Health and Ministry of Finance were also included in CGPID by Decree nr 7.175 (BRAZIL, 2010), which instituted the PNBL.

By the end of 2009, the Ministry of Communications released its first proposal for a Brazilian broadband plan, in a document called "A National Plan for Broadband: Brazil in High Speed." [44] (MC, 2009)

This document performed a diagnosis of broadband in Brazil and identified the factors that prevented the growth of broadband supply and demand. These restrictive factors are reproduced in Table 10:

Table 10: Restrictive factors for growth of broadband demand and supply in Brazil

Restrictive factors for growth of broadband demand
- proportion of households with computers (21%) and Internet connection subscriptions (15%);
- proportion of Internet users (35%), many of them using telecenters and cybercafés (called "LAN houses" in Brazil);
- proportion of broadband subscribers (5%);
- technical characteristics of broadband services and traffic limitations;
- high service rates and high price elasticity of demand;
- low average income of the population, especially in the North and Northeast regions of Brazil;
- low literacy levels; and
- low ICT skills levels.
Restrictive factors for growth of broadband supply in Brazil
- low broadband penetration rate in households;
- low level of competition among different broadband technologies;
- spectrum allocation and evaluation criteria of spectrum auctions;
- high investments required for upgrading existent infrastructure; and
- high demand for and low supply of data transport networks (backbones and backhauls), due to increasing infrastructure verticalization.

Source: MC (2009)

The 2009 proposal also mentioned the regulatory issues to be addressed in order to stimulate the "massification" of broadband: competition, quality and price. It discussed the lack of regulatory measures like unbundling and cost modeling, and the importance of mechanisms for fostering competition.

The broadband goals proposed by this document are reproduced in Table 11, and were to be reached by 2014. They indicate quantitative goals for fixed and wireless broadband subscriptions, and the goal of connecting all government agencies to broadband networks.

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[44] Translation of the original title, "Um Plano Nacional para a Banda Larga: O Brasil em Alta Velocidade", in Portuguese.

Table 11: Broadband goals of the Ministry of Communications 2009 broadband plan proposal

Scope and subscription type	Goals for 2014
Individual fixed subscription (urban and rural)	**30 million fixed broadband subscriptions** (29 million subscriptions representing 50% of urban households and 100% of micro and small enterprises, and 1 million subscriptions representing 15% of rural households), including subscriptions by households, properties, enterprises and cooperatives.
Collective fixed subscription (urban and rural)	Bring broadband access to 100% of government entities, including: • 100% of federal, state and municipal agencies. • 100% of public schools not yet reached by other programs (over 70,000 rural schools). • 100% of health units (over 177,000). • 100% of public libraries (over 10,000). • 100% of law enforcement agencies (over 14,000).
	Install 100,000 new federal telecenters.
Mobile subscription (wireless)	**60 million wireless broadband subscriptions**, comprising voice/data terminals with active data packages, and dedicated data modems.

Source: MC (2009)

In order to reach those goals, the 2009 document proposed several actions, which are reproduced in Annex 1. The actions were grouped in nine guidelines: for stimulating competition; for financing telecommunications; for reducing the tax burden; for regulation; for spectrum management; for federal government programs; for fomenting 'digital cities'; for telecenters; and for industrial and technological development.

The 2009 proposal estimated that the amount of investment needed to achieve its 2014 broadband goals would be: US$ 27.2 billion,[45] from telecommunications operators (using either equity or BNDES financing) and US$ 14.72 billion,[46] from government spending, including tax cuts.

The document also proposed the institution of a steering committee to coordinate the implementation of the NBP. This committee would assemble government agencies, industry, operators and society, and it would be responsible for monitoring and revising broadband goals.

However, the 2009 Ministry of Communications proposal was only part of the decision-making process that led to the creation of the Brazilian NBP. Among government officials, there was disagreement on some issues, like the creation of a state-owned company to supply broadband services, which was supported by advisors of the President, but not by the then-Minister of Communications.[47] Many discussions

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[45] The amount in reais is R$ 49 billion, considering an exchange rate of US$ 1.00 = R$ 1.80.

[46] The amount in reais is R$ 26.49 billion, considering an exchange rate of US$ 1.00 = R$ 1.80.

[47] Reports on those discussions spread over the internet by the time, which can be seen in <http://tecnologia.uol.com.br/ultimas-noticias/redacao/2010/02/10/ministros-detalham-plano-de-banda-larga-nacional-a-lula-nesta-quarta.jhtm>, in Portuguese.

and meetings were held within the government on such issues, until the final approval of the President was obtained.

Finally, on May 12, 2010, President Luiz Inácio Lula da Silva signed Decree nr 7.175 (BRAZIL, 2010), which officially created the National Broadband Program ("Programa Nacional de Banda Larga" – PNBL, in Portuguese).

Nevertheless, Decree nr 7.175 has not fixed broadband goals nor defined actions or recommendations to be undertaken. In fact, it only asserted objectives, guidelines and responsibilities related to the National Broadband Program.

Decree nr 7.175 affirmed that the objective of the PNBL was to promote and disseminate the use and delivery of ICT products and services, in order to:

a) "massify" the access to broadband Internet connection services;

b) hasten economic and social development;

c) promote digital inclusion;

d) reduce social and regional inequalities;

e) promote employment and income creation;

f) expand e-government services and facilitate the use of government services by citizens;

g) promote training of the population on the use of information technologies; and

h) increase Brazilian technological autonomy and competitiveness.

The decree stated that the PNBL would be implemented according to actions to be defined by CGPID, which would also have the following powers:

a) to define actions, goals and priorities of the PNBL;

b) to foster partnerships between public and private entities;

c) to establish the technical definition of broadband, in what refers to the PNBL;

d) to monitor and evaluate the actions undertaken within the PNBL; and

e) to publish an annual report on actions, goals and results of the PNBL.

Four ministries were included in CGPID: The Secretariat of Strategic Affairs of the Presidency, the Ministry of Development, Industry and Trade, the Ministry of Health and Ministry of Finance.

Moreover, four specialized groups were created within the CGPID: a group on infrastructure and telecommunications services, to be headed by the Ministry of Communications; a group on applications, headed by the Ministry of Planning, Budget and Management; a group on content, to be headed by the Ministries of Culture and of Education; and a group on industrial policy, technological development and innovation, to be headed by the Ministries of Development, Industry and Trade and of Science and Technology.

Decree nr 7.175 also addressed the recreation of the state-owned operator Telebras,[48] which would primarily focus on supplying wholesale Internet connection services to small providers.

The rationale is that it would induce an expansion of broadband penetration and a reduction in service rates, as final users in most unattractive or distant localities are served only by small providers. These small providers usually pay very high prices to owners of broadband infrastructure, due to small returns to investment, which imply in high rates to the final user.

Telebras would build its own infrastructure or use other government-owned telecommunications infrastructure assets,[49] in order to enter this market and induce an overall reduction of wholesale prices. In localities without appropriate service provision (these localities would be defined by CGPID), Telebras would also be able to supply broadband access to final users.

In addition, Telebras would implement the private network of the federal government and would support other broadband policies, such as the provision of Internet connection to universities, research centers, schools, hospitals, and telecenters.

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[48] There is discussion on whether the recreation of Telebras was legal, considering what is stated in Law nr 5.792 (BRAZIL, 1972), which created the company, and the regulatory framework instituted by LGT (BRAZIL, 1997). An example against the recreation of Telebras is Marques Neto (2010). Yet, this issue does not interfere with the scope of this article, as there were no judicial decisions invalidating the recreation of Telebras to this date.

[49] These government-owned telecommunications assets refer to fiber optic networks owned by government-owned companies Petrobras and Eletrobras, which cover many parts of the country and have a considerable amount of underused capacity.

Furthermore, Decree nr 7.175 asserted that Anatel would implement and perform the regulation of broadband according to the following guidelines:

a) promotion of competition and free enterprise;

b) stimulus to innovative businesses that develop the use of convergent services;

c) fast procedures for dispute resolution;

d) obligatory infrastructure sharing;

e) management of government-owned infrastructure and assets (including spectrum) focused on to reduction of service costs; and

f) increase of broadband supply when telecommunications infrastructure is built.

Thus, the actions and goals of the Brazilian broadband plan were still to be defined by CGPID, and Anatel and Telebras would be important players in the implementation of the PNBL. As consequence, it is not possible to affirm that Decree nr 7.175 is a national broadband plan itself, but only the first action directed to the definition and implementation of a plan.

Indeed, soon after Decree nr 7.175 was released, the government created the "Brazil Connected Forum",[50] designed to be a permanent round-table that would monitor, discuss and propose actions and guidelines for the PNBL. It assembled more than 60 entities from the government, private sector and society, which were directly concerned with broadband policies.[51] Participants would be able to contribute to the discussions through meetings, workshops, seminars, and even e-mail.

The first meeting of the Brazil Connected Forum occurred on June 23, 2010 (FBC, 2010a). In that meeting, the secretariat of the CGPID presented to the forum a matrix of 61 PNBL actions, divided in three levels: "in implementation", "in discussion" and "in initial formulation". The then-current level of progress of each action was also detailed to the participants. The forum would be able to:

a) monitor the implementation and make timely contributions to actions "in implementation";

b) generate information for the decision making process of actions "in discussion"; and

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[50] Translation of "Fórum Brasil Conectado", in Portuguese.
[51] The list of participants of the Brazil Connected Forum is reproduced in Annex 2.

c) produce knowledge and eventually formulate guidelines for medium- and long-term plans related to actions "in initial formulation".

Discussions within the Brazil Connected Forum continued through a second meeting on August 24-26, 2010 (FBC, 2010b), when the list of the first 100 cities that would be serviced by Telebras was released by CGPID. A third meeting was held on November 30, 2010, in which the "Base-document of the PNBL",[52] was launched (CGPID, 2010).

The "Base-document of the PNBL" presented the principles and actions of the PNBL to be performed until 2014. It stated that the initial focus of the PNBL would be the availability of broadband infrastructure and the formulation of policies for production and technology. As the program develops, it will deal with other issues like content, applications and services, including e-government, education, health, law enforcement, trade and services, information and entertainment.

As principles to be followed by PNBL, the base-document indicated the reduction of services rates, the increase of broadband coverage and the increase of broadband speed.

The actions of the PNBL were structured in four dimensions: infrastructure regulations; policies for production and technology; fiscal and financial incentives; and national network (Telebras).

On infrastructure regulations, the proposed actions were aimed at increasing competition, expanding service supply, incentivizing entrepreneurship and innovation, reducing service rates to the final user and increasing infrastructure availability.

Anatel would be responsible for implementing these actions, which included: drafting a new PGMU, with goals for the expansion of backhaul; performing spectrum auctions for wireless broadband, with requirements for investment in research and

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[52] Translation of "Documento base do Programa Nacional de Banda Larga", in Portuguese.

development (R&D) and for use of equipment with Brazilian technology; and regulating infrastructure sharing among service providers.

Policies for production and technology had the objective of developing the Brazilian telecommunications equipment industry. The proposed actions included financing with lower interest rates and tax cuts for the acquisition of equipment with Brazilian technology.

The actions on fiscal and financial incentives had the purpose of reducing service rates, in order to increase broadband adoption. Some of those actions consisted of: granting fiscal incentives to small providers; cutting taxes on modems; stimulating the supply of low-cost broadband subscriptions; and financing service providers and cybercafés.

The fourth dimension is related to building a "national network" using fiber optics that is owned by the federal government, in order to improve broadband infrastructure and to increase service supply. This network would be operated by Telebras, with the goal of reaching 4,278 municipalities by 2014.

The base-document presented a matrix with a total of 61 actions, structured in the four dimensions described above, plus other two dimensions: "services regulation" and "content and applications." The actions are reproduced in Table 12, divided by their level of maturity. These were exactly the same 61 actions presented to the Brazil Connected Forum in its first meeting, which shows that the discussions within the forum were unable to change any of the actions proposed or to add new actions.[53]

Table 12: PNBL "base document" actions

1. Infrastructure regulations
In implementation
- None.
In discussion
- Install ducts and fiber optics for telecommunications networks in new infrastructure public works.
- Foment the sharing of public and private installed infrastructure (ducts, poles, towers, etc.) to implement telecommunications networks.
In initial formulation
- None.

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[53] This is relevant because it may be the consequence of two reasons for concern: CGPID may have ignored contributions from the stakeholders present at the Brazil Connected Forum, so the forum was worthless; or the stakeholders were unable to present any valuable contribution, either because they were unprepared or indifferent to broadband policies. This study, however, will not analyze in detail the discussions held in the three meetings of the Brazil Connected Forum.

2. Services regulation

In implementation
- Review universalization goals (3rd PGMU) in order to increase backhaul coverage and capacity (Anatel).
- 3G in all municipalities (Anatel).
- Detail rules and conditions for data network interconnection (Anatel).
- Sharing of telecommunications networks and infrastructure (Anatel).
- Auction of the 450 MHz spectrum range, to provide broadband in rural areas (Anatel).
- Auction of the 3.5 GHz spectrum range, to increase the number of broadband operators that users can choose (Anatel).

In discussion
- In evaluating spectrum auctions bids, give more value to public interest obligations (installation of infrastructure, lowest service rate to final user, largest supply of network capacity, etc.) (Anatel)
- Allocate part of the spectrum to digital inclusion applications of federal, state and local governments (Anatel).
- Revise the regulation on remuneration of use of networks (Anatel).
- Establish obligations related to network neutrality (Anatel).
- Regulate and monitor broadband quality parameters (Anatel).
- Regulate procedures to define which telecommunications operators have significant market power (Anatel).
- Allocate spectrum blocks in different coverage areas, so as to enable the participation of large, medium and small telecommunications providers in spectrum auctions (Anatel).
- Give more guarantees on secondary use of spectrum (subject to interference) by small and very small operators (Anatel).
- Regulate rights and duties related to the provision of access, hosting and content, establishing alternative dispute resolution mechanisms (Anatel).
- Regulate procedures to define which telecommunications operators have significant market power (Anatel). (repeated)
- Use FUST to further extension of backhaul and network access (Anatel).
- Regulate the convergent authorization framework for services of collective interest (Anatel).
- Criteria for letting Telebras offer subscription to final users.

In initial formulation
- Universalization policies – evaluation of regulatory mechanisms used in Brazil and throughout the world for universalization and applicability of broadband.
- Super broadband – evaluation of the regulatory framework and possible strategies to enable its availability.
- Convergence and institutional structure – evaluation of the regulatory framework, including division of powers among federal agencies, related to the permeability of innovative services and the convergence of networks, services and content.
- Spectrum – alternatives to lower service costs, to enable innovative solutions and to meet the demand for new applications and services.
- Criteria for defining broadband and creation of an information label to consumers.

3. Fiscal and financial incentives

In implementation
- Federal stimulus to local initiatives: credit for digital cities projects that increase broadband individual subscriptions with satisfactory service and low price.
- FUST tax cut for small and medium operators (included in the tax simplification program - Simples).

In discussion
- Financing for very small, small and medium telecommunications operators and cybercafés ("LAN Houses").
- Service plans with fiscal incentives.
- Modem for all: PIS/COFINS tax cut for modems.

In initial formulation
- Tax structure – Impacts of sales tax (ICMS) reduction for broadband subscriptions on states' finance and service costs.

4. Policies for Production and Technology

In implementation
- Include FUNTTEL in the list of science and technology funds that are not subject to budget constraints.
- 100% cut for the Industrialized Products Tax (IPI) on telecommunications equipment made with Brazilian technology.
- Use government procurement to foment national technology (Decree nr 7.174/2010).

In discussion
- Compensatory measures in R&D and utilization of Brazilian technology equipment (Anatel).
- Finance the acquisition of Brazilian technology telecommunications equipment with favored conditions through BNDES.

In initial formulation
- Innovation, national entrepreneurship and capacity building – evaluation of the role of entrepreneurship in R&D and necessary steps for the construction of a self-sustainable ecosystem.
- National satellite – necessity and feasibility.
- National technology and globalization – challenges and strategy for development.

5. National network (Telebrás)

In implementation
- Implementation of the network core (backbone) in the Federal District and 15 states (Northeast and Southeast rings).
- Building and provision of access to 96 corporative spots of the federal government in state capitals.
- Bring the backhaul to 100 cities, offering access to government facilities (priorities: education, health and law enforcement).

In discussion
- Implementation of an optic backbone to support the federal government intranet – government networks in the state capitals of the Southeast, Northeast and South regions.
- Extension of the optic backbone to the Center-West and North Regions.
- Integration and/or sharing with state government networks.
- Integration and/or sharing with local government networks.
- Implementation of IXP in specific locations of the national backbone.
- Increase of backhaul capacity in order to meet government needs ("Public spots").
- Adjust the backbone for interconnection with backhauls and build a backhaul to support public policies.
- Integration and sharing with the Digital Cities Program.
- Integration with the Digital Inclusion Program.

In initial formulation

None
6. Content and applications
In implementation
None
In discussion
- IPEA network for research and creation of sectoral indicators.
In initial formulation
- ICT training and qualification policy.
- Sectoral indicators for the PNBL.
- Telemedicine, electronic medical records and other health applications – adoption strategies and demand for infrastructure.
- Cloud computing – infrastructure demand and possibilities for the development of applications.
- Electronic citizenship – possible applications to expand interaction between government and citizen, and demand for infrastructure.
- Distance learning – possibilities and demand for infrastructure.
- Brazil and the electronic gaming industry – diagnosis and possibilities.
- National content, regionalism and local entrepreneurship – opportunities and strategy through broadband diffusion.

Source: CGPID (2010)

For most of these actions, the base-document has not fixed goals or terms for conclusion and it has not defined which entities are responsible for implementation. In addition, the meaning of the levels of maturity is unclear, especially on whether the actions "in discussion" and "in initial formulation" will be subject to further discussions within the Brazil Connected Forum or when their implementation will start.

In fact, it is unclear if the federal government considers that the base-document remains valid as the statement of PNBL actions. In 2011, soon after President Dilma Rousseff took office, federal government issued Decree nr 7.462 (BRAZIL, 2011a), which moved the responsibility of formulating and implementing broadband and digital inclusion policies from the CGPID to the Ministry of Communications.

Since then, CGPID stopped working and the Brazil Connected Forum never met again to follow the implementation of the PNBL or to propose new actions. By the end of 2011, the Chamber of Deputies subcommittee on the PNBL proposed the reactivation of the Brazil Connected Forum, so as to reestablish the PNBL governance model and the participation of society (CCTCI, 2011), but the situation remains unchanged to this date.

Moreover, the federal government has not been following some of the actions proposed in the base-document. Although a new PGMU has been enacted by Decree 7.512 (BRAZIL, 2011b), it does not contain goals for the expansion of backhaul. Instead, it establishes that current capacity of backhaul must be kept unchanged.

This is because government decided to negotiate with concessionaires a reduction in broadband service rates, in exchange of releasing them from new backhaul goals. It resulted in the signature of an agreement,[54] in which the concessionaires committed themselves to provide, in selected municipalities and according to a predefined schedule,[55] lower service rates to final users,[56] and to small providers in the wholesale market,[57] until the end of 2016. This deal has been announced by the government as part of the PNBL, and the Ministry of Communications claimed that 1.2 million broadband subscriptions have been contracted within the terms of this agreement by March 2012.[58]

Another example of how government has turned away from some of the "base-document" proposals is the weak performance of Telebras in building the "national network". By the end of 2011, Telebras had only signed 25 contracts for sale of broadband capacity to small providers (TELEBRAS, 2012), and its backhaul was not able to reach the first 100 cities defined by CGPID during the 2nd meeting of the Brazil Connected Forum.[59] One of the reasons for this may be the severe budget limitations imposed by the federal government, which released only US$ 194.5 million,[60] to the company that year.

On the other hand, the spectrum auctions for wireless broadband that were proposed by the "base-document" continue to be in government's agenda. Decree 7.512 (BRAZIL, 2011b) prescribed that Anatel should perform, until April 30, 2012, auctions for the 450 MHz and 2.5 GHz bands, the former focused on bringing telephony and broadband to rural areas and the later on building 4G wireless broadband networks.

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[54] An example of such agreement is MC (2011b).

[55] The schedule for concessionaire Oi was that 300 municipalities should be attended with lower rates for final users by December 31, 2011; 1,200 municipalities by June 30, 2012; 2,600 municipalities by June 30, 2013; 4,000 municipalities by June 30, 2014; and 4,668 municipalities by December 31, 2014 (MC, 2011b).

[56] The monthly service rate for final users would be US$ 19.45 (R$ 35.00 considering an exchange rate of US$ 1.00 = R$ 1.80 and no tax cut), for 1 Mbit/s download speed and 128 Kbit/s upload speed, with download limitations.

[57] The monthly rate would be US$ 696.12 (R$ 1,253.00 considering an exchange rate of US$ 1.00 = R$ 1.80 and no tax cut) for every link of 2 Mbit/s contracted.

[58] A press release by the Ministry of Communications on this issue, referring to the reduced rates for final users as "popular broadband" within the PNBL, can be found in <http://www.mc.gov.br/noticias-do-site/24135-140312-banda-larga-popular-ja-registra-mais-de-1-milhao-de-ligacoes>, in Portuguese.

[59] The Brazilian press reported extensively on the implementation delays of the Telebras "national network", as can be seen in <http://www.arede.inf.br/inclusao/component/content/article/106-acontece/4186-com-metas-atrasadas-telebras-se-prepara-para-ajustes>, in Portuguese.

[60] R$ 350,000,000.00 considering an exchange rate of US$ 1.00 = R$ 1.80.

Furthermore, the government's Pluriannual Plan proposal for years 2012 to 2015, [61] (MPOG, 2011a) established indicators and goals for broadband (MPOG, 2011b), which are reproduced in Tables 13 and 14. The goals indicate three dimensions of concern for broadband policies: expanding infrastructure penetration, increasing broadband adoption and developing the Brazilian telecommunications equipment industry.

Table 13: Indicators for broadband established by the Pluriannual Plan 2012-2015

Indicators	Unit of measurement	Reference	
		Date	Index
Number of users with broadband and dial-up Internet accesses	units	12/31/2009	67,900,000.00
Percentage of Internet accesses with speeds below 1 Mbps	%	7/31/2011	54.00
Percentage of households with Internet access	%	11/30/2010	27.00
Percentage of households with fixed Internet access – rural area	%	12/31/2008	3.00
Percentage of households with fixed Internet access – urban area	%	12/31/2008	23.40
Percentage of public schools with broadband	%	4/30/2011	38.00
Average monthly Internet access rate to average income ratio	%	3/31/2011	4.58
Broadband subscriptions to total number of households with Internet access ratio	%	11/30/2010	68.00
Percentage of households that own a computer	%	11/30/2010	35.00
Percentage of municipalities where the leading Internet provider has over 90% of market share	%	12/31/2009	79.60

Source: MPOG (2011b)

Table 14: Goals for broadband established by the Pluriannual Plan 2012-2015

Objective: Extend infrastructure and electronic media services, telecommunications and postal services, promoting population access and looking for best price, coverage and quality. (Responsible entity: Ministry of Communications) **Goals:** - Supply broadband to all rural public schools - **Bring quality broadband to 40 million households through PNBL** (2.8 million in Center-West Region; 10 million in Northeast Region; 2 million in North Region; 18.7 million in Southeast Region and 6.5 million in South Region) - Provide high and medium-speed data connection via mobile telephony operators, using the 1.9/2.1 GHz spectrum range, in at least 75% of municipal seats - Supply 10 Mbps fixed broadband and 4G mobile broadband in the host cities of the 2013 Confederations Cup, 2014 World Cup and 2016 Olympic Games, and meet the quality requirements of those events - At least 2% of the population with broadband access in 95% of municipalities (97% in Center-West Region; 97% in Northeast Region; 60% in North Region; 99% in Southeast Region and 99% in South Region)
Objective: Promote the use of communications goods and services, focusing on applications, services and creative digital content to boost Brazil's economic and social development. (Responsible entity: Ministry of Communications) **Goals:** - 40% of "classes D and E" population accessing the Internet (broadband and dial-up) (40% in Center-West Region; 30% in Northeast Region; 30% in North Region; 45% in Southeast Region and 40% in South Region) - 70% of the population using broadband or dial-up Internet connections (either at home, at work, at telecenters, etc.), considering regional and socio-economic inequalities (69% in Center-West Region; 65% in Northeast Region; 65% in North Region; 75% in Southeast Region and 67% in South Region) - 70% of "class C" population accessing the Internet (broadband and dial-up) (60% in Center-West Region; 55% in Northeast Region; 55% in North Region; 75% in Southeast Region and 60% in South Region) - Government of 3700 municipalities, among those with lowest levels of human development index (HDI below 0.800), using and supplying applications and digital communication services (315 municipalities in Center-West Region; 1337 municipalities in Northeast Region; 336 municipalities in North Region; 1083 municipalities in Southeast Region and 629 municipalities in South Region)
Objective: Promote the development of the Brazilian communications supply chain and its international competitiveness, by fostering research, development, innovation and stimulus to the use of goods and services with Brazilian technology. (Responsible entity: Ministry of Communications) **Goals:** - Develop at least two low-cost mobile broadband terminals.

Source: MPOG (2011b)

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[61] The Pluriannual Plan is a law that establishes, for a 4-year-period, "on a regional basis, the directives, objectives and targets of the federal public administration for the capital expenditures and other expenses resulting therefrom and for those regarding continuous programs" (BRAZIL, 1988). It is the primary budget law of Brazil, as annual budgets must comply with the guidelines imposed by the Pluriannual Plan.

It is noticeable, therefore, that the PNBL is not restricted to a single document that states policies, actions and goals. It is made of diverse documents, such as Decrees 7.175 and 7.512, the 2009 Ministry of Communications proposal, the "base document" of the PNBL, the agreement with concessionaires and the Pluriannual Plan, among others, that separately defined those policies, actions and goals. Virtually any new action can be formulated and performed by the government within the PNBL, as long as it complies with the objectives and guidelines fixed by Decree nr 7.175.

It is also visible that the governance structure proposed by the 2009 Ministry of Communications document and established by Decree 7.175, with the empowerment of CGPID and later creation of the Brazil Connected Forum, has been abandoned by the federal government. Consequently, the participation of interested parties and of other stakeholders has been reduced, and both policymaking and monitoring of actions within the PNBL are now under the sole responsibility of the Ministry of Communications.

Also, the actions proposed in these documents emphasize the construction of broadband infrastructure and the reduction of service rates as instruments to increase broadband penetration and adoption rates. Few actions have addressed the development of content, applications and services for broadband networks, and none of them tackled the issue of low digital literacy levels.

Nevertheless, the most recent numbers of broadband subscriptions in Brazil indicate a rise in adoption rates, which may indicate that the broadband policies implemented by the Brazilian government have been achieving good results.

As of March 2012, according to TELEBRASIL, [62] there were 63.5 million broadband subscriptions, which represent a 70% increase in one year. From that total, there were 16.3 million fixed broadband subscriptions and 47.2 million wireless broadband subscriptions. It also reported that 2,769 municipalities were covered by 3G networks, reaching 84% of the population.

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[62] A press release on these numbers can be found in <http://www.telebrasil.org.br/artigos/artigos.asp#1213>, in Portuguese.

A close number has been presented by Huawei (2012), which indicated that, as of December 2011, there were 16.5 million fixed broadband subscriptions and 41.1 million wireless broadband subscriptions. Huawei has also stated that 99.8% of Brazilian municipalities were covered by fixed broadband and 48.5% of municipalities by wireless broadband, which represented 84% of the population.

Yet, despite the good numbers achieved by broadband in Brazil after the enactment of the PNBL, the benchmarking of this program with the U.S. National Broadband Plan may still reveal good practices to be followed. Section 3 presents the U.S. NBP and Section 4 performs the comparative review of both plans.

3. THE UNITED STATES NATIONAL BROADBAND PLAN

3.1 Telecommunications regulation and broadband policies in the United States

The United States has a complex telecommunications regulatory framework, which encompasses a number of government agencies at both federal and state levels.

Under the provisions of the Communications Act of 1934, as amended by the Telecommunications Act of 1996 – 47 U.S.C. §§ 151 – 621 (USA, 1934), the Federal Communications Commission (FCC) has regulatory authority over interstate telecommunications services and facilities used jointly for interstate and intrastate services, which includes services provided by wire, radio, television, and cable. FCC is an independent agency overseen by U.S. Congress and its commissioners are appointed by the President and confirmed by the Senate.

The universalization of communications services has been an objective of FCC action since its conception – 47 U.S.C. § 151 (USA, 1934). After the legal reform provided by the Telecommunications Act of 1996, which codified the principles of universal service, [63] and authorized FCC to institute mechanisms to fund universalization, the Commission created the Universal Service Fund (USF),[64] mainly focused on fixed telephony.

FCC has also the mandate to encourage "the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms)," in accordance with Section 706 of the Telecommunications Act of 1996 (USA, 1996), which includes

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[63] The principles of universal service stated by the Telecommunications Act of 1996 are: quality and rates; access to advanced services; access to advanced services; equitable and nondiscriminatory contributions; specific and predictable support mechanisms; and access to advanced telecommunications services for schools, health care, and libraries – 47 U.S.C. § 254 (USA, 1934).

[64] USF receives payments from telecommunications operators and supports four programs: the High-Cost program, "which assists customers living in high-cost, rural, or remote areas through financial support to telecommunications carriers that operate in such areas"; the Low-Income Program, which promotes "telephone subscribership among low-income households"; the Schools and Libraries Program, "which assists eligible schools and libraries in procuring telecommunications and Internet services, as well as internal connections and basic maintenance for such services"; and the Rural Health Care Program, "which assists health care providers located in rural areas through discounts for telecommunications and Internet access services" (GAO, 2010b).

broadband. Indeed, one of the focuses of FCC's work is the promotion of broadband, as stated by the number 1 goal of its Strategic Plan 2012-2016 (FCC, 2012):

"Strategic Goal 1: Connect America

Maximize Americans' access to – and the adoption of – affordable fixed and mobile broadband where they live, work, and travel."

Regulation over intrastate services is performed by States through a Public Utilities Commission (VOGELSANG and MITCHELL, 1997). However, telecommunications regulation at state level tends to decrease in importance as new communications technologies, especially broadband, increase interstate data exchange and diminish the percentage number of local services.

On telecommunications policymaking, the National Telecommunication and Information Administration (NTIA), an agency within the Department of Commerce, is responsible for advising the President on telecommunications and information policy issues (USA, 1978). NTIA is more concerned with telecommunications infrastructure rather than regulation (VOGELSANG and MITCHELL, 1997), and the current focus of its activities is the expansion of broadband penetration and adoption in the United States.[65]

Also, the Rural Utilities Service of the Department of Agriculture (RUS) is the agency responsible for supporting public utilities to rural areas, including telecommunications. RUS manages loans and grants to programs focused on deployment of infrastructure in those areas, including broadband.

Therefore, these agencies have been concerned with the deployment of broadband networks and their adoption in the last years, especially after the 2008 financial crisis and the need for reestablishing economic growth.

The U.S. Congress has also expressed concern on the status of broadband deployment in the country, due to its impact on economy. In 2008, it passed the Broadband Data Improvement Act (USA, 2008), which required FCC to "compile a list

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[65] Information from NTIA website, at <http://www.ntia.doc.gov/about>.

of geographical areas that are not served by any provider of advanced telecommunications capability" and to "collect and examine data on the extent of broadband service capability in other countries as part of its annual consideration of whether advanced telecommunications capability is being deployed to all Americans on a reasonable and timely basis".[66]

In addition, the American Recovery and Reinvestment Act of 2009 (USA, 2009), also known as "stimulus package," established a number of initiatives to be undertaken by FCC, NTIA and RUS related to broadband deployment.

The stimulus package provided US$ 2.5 billion to RUS and US$ 4.7 billion to NTIA, in order to allow both agencies to award grants and loans to broadband projects. RUS created the Broadband Initiatives Program (BIP) to support broadband infrastructure projects in rural areas. The Recovery Act also authorized NTIA to create the Broadband Technology Opportunities Program (BTOP) "to support broadband infrastructure deployment, public computer centers, and innovative projects to stimulate demand for, and adoption of, broadband" (GAO, 2011).

BTOP was a program focused on short-term actions in broadband and had the following goals:

> *"1. To provide access to broadband service to consumers residing in unserved areas of the country;*
> *2. To provide improved access to broadband service to consumers residing in underserved areas of the country;*
> *3. To provide broadband access, education, awareness, training, equipment, and support to community anchor institutions (e.g., schools, libraries, medical facilities), or organizations and agencies serving vulnerable populations (e.g., low income, unemployed, aged), or job-creating strategic facilities located in state- or federally designated economic development areas;*
> *4. To improve access to, and use of, broadband service by public safety agencies; and*
> *5. To stimulate the demand for access to and use of broadband, economic growth, and job creation."* (NTIA, 2010, p. 2)

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[66] Information from FCC website, at <http://transition.fcc.gov/ib/bdia.html>.

The Recovery Act of 2009 also required the FCC to develop a National Broadband Plan, which should seek "to ensure that all people of the United States have access to broadband capability" and should "establish benchmarks for meeting that goal." It stated that FCC should use data provided under the Broadband Data Improvement Act and that the NBP should include:

"(A) an analysis of the most effective and efficient mechanisms for ensuring broadband access by all people of the United States;

(B) a detailed strategy for achieving affordability of such service and maximum utilization of broadband infrastructure and service by the public;

(C) an evaluation of the status of deployment of broadband service, including progress of projects supported by the grants made pursuant to this section; and

(D) a plan for use of broadband infrastructure and services in advancing consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, worker training, private sector investment, entrepreneurial activity, job creation and economic growth, and other national purposes." (USA, 2009, p. 402)

This mandate from U.S. Congress addresses not only the increase of availability of broadband networks, but also the maximization of adoption and use of broadband services and applications. The concern on broadband penetration and adoption rates in the United States was due to its position behind some developed countries that implemented broadband plans earlier. As affirmed by GAO (2010a), in 2010 United States had a penetration rate of 95% of households and an adoption rate of 26.4%, which ranked 15th among OECD countries.

Consequently, the main focus of the U.S. broadband plan would not be the deployment of infrastructure, even though it would address the remaining 5% of the population with no access, but the increase of adoption and use of broadband networks. This way, different government areas, such as education, health and energy, would be affected by NBP actions, as broadband services and applications cross such sectors.

It should be noted, however, that U.S. Congress did not grant to the Commission the power to enforce the actions and goals to be proposed. Therefore, FCC developed the NBP with a strong participation of stakeholders and government agencies that

would be affected by its recommendations. The discussion process, actions and goals of the U.S. National Broadband Plan will be presented in the next section.

3.2 U.S. National Broadband Plan discussion process, actions and goals

FCC started the drafting process of the U.S. NBP with the publication of a Notice of Inquiry – NOI FCC 09-31 (FCC, 2009) in April 2009, which sought "comment to inform the development of a national broadband plan" from "all interested parties on the elements that should go into a national broadband plan." The NOI requested comment on the issues presented in Table 15:

Table 15: Issues presented in Notice of Inquiry FCC 09-31

- approaches to developing a NBP; - definition of broadband capacity and access; - measurement of progress; - market analysis; - effective and efficient mechanisms for ensuring access, including cost estimation, universal service programs, wireless service policies and competition; - affordability and maximum utilization of broadband infrastructure and service by the public; - evaluation of the status of broadband deployment, including progress of projects supported by the stimulus package grants; - specific policy goals, including consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, worker training, private sector investment, entrepreneurial activity, job creation and economic growth; and - the improvement of government performance and coordination with stakeholders.

Source: FCC (2009).

The NOI received over 500 comments.[67] FCC also held 36 workshops and 9 field hearings,[68,69] and released 31 public notices,[70] to discuss the development of the broadband plan, so as to assure a broader participation of all interested parties and stakeholders. FCC also created a website for the plan at <www.broadband.gov> and accepted contributions sent by e-mail.

On March 16, 2010,[71] FCC submitted to U.S. Congress the document "Connecting America: The National Broadband Plan" (FCC, 2010), which compiled the NBP as demanded by the Recovery Act of 2009.

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[67] Information from FCC website, at <http:// www.fcc.gov/guides/recent-fcc-broadband-initiatives>.

[68] The list of workshops and filed hearings held by FCC is presented in Annex 3.

[69] Documents and presentations related to these workshops and field hearings can be found at <http://www.broadband.gov/workshops.html> and <http://www.broadband.gov/fieldevents/>.

[70] The list of public notices released by FCC is presented in Annex 4.

[71] Information from the U.S. NBP website, at <http://blog.broadband.gov/?entryId=281476>.

The U.S. NBP defined 6 long-term goals, to be achieved by 2020, which are reproduced in Table 16. They derive from the premise that United States should lead broadband deployment and use in the world, in order to create the most "attractive market for broadband applications, devices and infrastructure" and to give to all Americans the social and economic benefits of advanced communications technologies.

Table 16: U.S. NBP long-term goals for 2020

Goal	Description
Goal 1	At least 100 million U.S. homes should have affordable access to actual download speeds of at least 100 megabits per second and actual upload speeds of at least 50 megabits per second.
Goal 2	The United States should lead the world in mobile innovation, with the fastest and most extensive wireless networks of any nation.
Goal 3	Every American should have affordable access to robust broadband service, and the means and skills to subscribe if they so choose.
Goal 4	Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals and government buildings.
Goal 5	To ensure the safety of the American people, every first responder should have access to a nationwide, wireless, interoperable broadband public safety network.
Goal 6	To ensure that America leads in the clean energy economy, every American should be able to use broadband to track and manage their real-time energy consumption.

Source: FCC (2010)

The broadband plan also recommended actions to be undertaken and identified which government agency would be responsible for the implementation – even though FCC would be unable to enforce it. The definition of these actions considered four dimensions of government intervention on the broadband ecosystem:

> *"1. Design policies to ensure robust competition and, as a result maximize consumer welfare, innovation and investment.*
>
> *2. Ensure efficient allocation and management of assets government controls or influences, such as spectrum, poles, and rights-of-way, to encourage network upgrades and competitive entry.*
>
> *3. Reform current universal service mechanisms to support deployment of broadband and voice in high-cost areas; and ensure that low-income Americans can afford broadband; and in addition, support efforts to boost adoption and utilization.*
>
> *4. Reform laws, policies, standards and incentives to maximize the benefits of broadband in sectors government influences significantly, such as public education, health care and government operations."*   (FCC, 2010, p. XI)

A summary of the U.S. NBP recommended actions, divided by these four dimensions, is reproduced in Table 17, and the complete list of recommendations is reproduced in Annex 5.

Table 17: Summary of the U.S. NBP recommendations

Establishing competition policies
- Collect, analyze, benchmark and publish detailed, market-by-market information on broadband pricing and competition, which will likely have direct impact on competitive behavior (e.g., through benchmarking of pricing across geographic markets). This will also enable the FCC and other agencies to apply appropriate remedies when competition is lacking in specific geographies or market segments.
- Develop disclosure requirements for broadband service providers to ensure consumers have the pricing and performance information they need to choose the best broadband offers in the market. Increased transparency will incent service providers to compete for customers on the basis of actual performance.
- Undertake a comprehensive review of wholesale competition rules to help ensure competition in fixed and mobile broadband services.
- Free up and allocate additional spectrum for unlicensed use, fostering ongoing innovation and competitive entry.
- Update rules for wireless backhaul spectrum to increase capacity in urban areas and range in rural areas.
- Expedite action on data roaming to determine how best to achieve wide, seamless and competitive coverage, encourage mobile broadband providers to construct and build networks, and promote entry and competition.
- Change rules to ensure a competitive and innovative video set-top box market, to be consistent with Section 629 of the Telecommunications Act. The Act says that the FCC should ensure that its rules achieve a competitive market in video "navigation devices," or set-top boxes—the devices consumers use to access much of the video they watch today.
- Clarify the Congressional mandate allowing state and local entities to provide broadband in their communities and do so in ways that use public resources more effectively.
- Clarify the relationship between users and their online profiles to enable continued innovation and competition in applications and ensure consumer privacy, including the obligations of firms collecting personal information to allow consumers to know what information is being collected, consent to such collection, correct it if necessary, and control disclosure of such personal information to third parties.

Ensuring efficient allocation and use of government-owned and government-influenced assets

a) Spectrum policy:
- Make 500 megahertz of spectrum newly available for broadband within 10 years, of which 300 megahertz should be made available for mobile use within five years.
- Enable incentives and mechanisms to repurpose spectrum to more flexible uses. Mechanisms include incentive auctions, which allow auction proceeds to be shared in an equitable manner with current licensees as market demands change. These would benefit both spectrum holders and the American public. The public could benefit from additional spectrum for high-demand uses and from new auction revenues. Incumbents, meanwhile, could recognize a portion of the value of enabling new uses of spectrum. For example, this would allow the FCC to share auction proceeds with broadcasters who voluntarily agree to use technology to continue traditional broadcast services with less spectrum.
- Ensure greater transparency of spectrum allocation, assignment and use through an FCC-created spectrum dashboard to foster an efficient secondary market.
- Expand opportunities for innovative spectrum access models by creating new avenues for opportunistic and unlicensed use of spectrum and increasing research into new spectrum technologies.

b) Infrastructure policy:
- Establish low and more uniform rental rates for access to poles, and simplify and expedite the process for service providers to attach facilities to poles.
- Improve rights-of-way management for cost and time savings, promote use of federal facilities for broadband, expedite resolution of disputes and identify and establish "best practices" guidelines for rights-of-way policies and fee practices that are consistent with broadband deployment.
- Facilitate efficient new infrastructure construction, including through "dig-once" policies that would make federal financing of highway, road and bridge projects contingent on states and localities allowing joint deployment of broadband infrastructure.
- Provide ultra-high-speed broadband connectivity to select U.S. Department of Defense installations to enable the development of next-generation broadband applications for military personnel and their families living on base.

Creating incentives for universal availability and adoption of broadband
a) Ensure universal access to broadband network services.
- Create the Connect America Fund (CAF) to support the provision of affordable broadband and voice with at least 4 Mbps *actual* download speeds and shift up to $15.5 billion over the next decade from the existing Universal Service Fund (USF) program to support broadband. If Congress wishes to accelerate the deployment of broadband to unserved areas and otherwise smooth the transition of the Fund, it could make available public funds of a few billion dollars per year over two to three years.
- Create a Mobility Fund to provide targeted funding to ensure no states are lagging significantly behind the national average for 3G wireless coverage. Such 3G coverage is widely expected to be the basis for the future footprint of 4G mobile broadband networks.
- Transition the "legacy" High-Cost component of the USF over the next 10 years and shift all resources to the new funds. The $4.6 billion per year High Cost component of the USF was designed to support primarily voice services. It will be replaced over time by the CAF.
- Reform intercarrier compensation, which provides implicit subsidies to telephone companies by eliminating per-minute charges over the next 10 years and enabling adequate cost recovery through the CAF.
- Design the new Connect America Fund and Mobility Fund in a tax-efficient manner to minimize the size of the broadband availability gap and thereby reduce contributions borne by consumers.
- Broaden the USF contribution base to ensure USF remains sustainable over time.
b) Create mechanisms to ensure affordability to low-income Americans.
c) Expand the Lifeline and Link-Up programs by allowing subsidies provided to low-income Americans to be used for broadband.
- Consider licensing a block of spectrum with a condition to offer free or low-cost service that would create affordable alternatives for consumers, reducing the burden on USF.
d) Ensure every American has the opportunity to become digitally literate.
- Launch a National Digital Literacy Corps to organize and train youth and adults to teach digital literacy skills and enable private sector programs addressed at breaking adoption barriers.

Updating policies, setting standards and aligning incentives to maximize use for national priorities
a) Health care
- Help ensure health care providers have access to affordable broadband by transforming the FCC's Rural Health Care Program.

- Create incentives for adoption by expanding reimbursement for e-care.
- Remove barriers to e-care by modernizing regulations like device approval, credentialing, privileging and licensing.
- Drive innovative applications and advanced analytics by ensuring patients have control over their health data and ensuring interoperability of data.

b) Education
- Improve the connectivity to schools and libraries by upgrading the FCC's E-Rate program to increase flexibility, improve program efficiency and foster innovation by promoting the most promising solutions and funding wireless connectivity to learning devices that go home with students.
    - Accelerate online learning by enabling the creation of digital content and learning systems, removing regulatory barriers and promoting digital literacy.
    - Personalize learning and improve decision–making by fostering adoption of electronic educational records and improving financial data transparency in education.

c) Energy and the environment.
- Modernize the electric grid with broadband, making it more reliable and efficient.
- Unleash energy innovation in homes and buildings by making energy data readily accessible to consumers.
- Improve the energy efficiency and environmental impact of the ICT sector.

d) Economic opportunity
- Support broadband choice and small businesses' use of broadband services and applications to drive job creation, growth and productivity gains.
- Expand opportunities for job training and placement through an online platform.
- Integrate broadband assessment and planning into economic development efforts.

e) Government performance and civic engagement
- Allow state and local governments to purchase broadband from federal contracts such as Networx.
- Improve government performance and operations through cloud computing, cybersecurity, secure authentication and online service delivery.
- Increase civic engagement by making government more open and transparent, creating a robust public media ecosystem and modernizing the democratic process.

f) Public safety and homeland security
- Support deployment of a nationwide, interoperable public safety mobile broadband network, with funding of up to $6.5 billion in capital expenditures over 10 years, which could be reduced through cost efficiency measures and other programs. Additional funding will be required for operating expenses.
- Promote innovation in the development and deployment of next-generation 911 and emergency alert systems.
- Promote cybersecurity and critical infrastructure survivability to increase user confidence, trust and adoption of broadband communications.

Source: FCC (2010)

As expected, the U.S. NBP actions have a strong focus on maximizing the use of broadband networks to increase adoption rates. Specific areas whose services and applications could stimulate the use of broadband networks and benefit from them have been addressed, such as health care, education, energy and environment, e-government, and public safety.

Energy, for example, received 12 recommendations in 3 groups of actions (integrate broadband into the smart grid, unleash innovation in smart homes and smart buildings, and accelerate sustainable ICT), which were addressed to FCC, to NTIA, to RUS, to the North American Electric Reliability Corporation (NERC), to the U.S. Department of Energy (DOE), to the Federal Energy Regulatory Commission (FERC), to states and to the federal government.

The U.S. NBP also has recommendations aimed at eliminating the small gap in broadband penetration, as well as increasing infrastructure capacity and availability in the future. In that sense, it recommended the reform of the USF, to guarantee the use of its funds in the deployment of broadband networks and the adoption by low income

citizens. It also recommended new spectrum and infrastructure policies, in order to promote efficient allocation of resources and to increase network capacity. Most of these recommendations are directed to FCC.

Finally, the broadband plan has a set of recommendations to increase competition in the broadband market, which included the benchmarking of prices and the stimulus to competition between fixed and wireless services.

The U.S. NBP proposed a governance model for its implementation, as it recommended to the Executive Branch the creation of a Broadband Strategy Council. It also recommended that FCC should publish a Broadband Dashboard to track the NBP goals. Both recommendations are yet to be implemented, but FCC has been keeping track of the actions that were addressed to itself through progress reports.[72]

Actually, FCC has not been following the implementation of U.S. NBP recommendations addressed to other agencies, as the Commission does not have legal powers to do so and the implementation is not mandatory.

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[72] The progress report on the first year of the U.S. NBP can be found at <http://www.broadband.gov/plan/broadband-progress-report.html>.

4. REVIEWING THE PLANS – GOOD PRACTICES AND POSSIBLE IMPROVEMENTS FOR THE PNBL

The comparison of the PNBL and the U.S. NBP will consider the discussion process and development of both, their structure and focus of the plans.

As shown in Sections 2.3 and 2.4, the discussion process and development of the PNBL was supposed to guarantee the participation of different government agencies involved in ICT policies and the coordination of their actions through CGPID. It would also ensure a broad contribution from all interested parties and stakeholders via Brazil Connected Forum.

CGPID, as a steering committee for digital inclusion policies, had an important participation in the beginning of the development of the PNBL. It was responsible for drafting the actions of the plan, which were later disclosed in the "base-document of the PNBL", and also for defining the municipalities that were initially going to be served by the Telebras broadband network.

The only arena that discussed the actions proposed by CGPID was the Brazil Connected Forum. Although this forum assembled different agencies and organizations that were engaged in digital inclusion programs and telecommunications issues, its discussions were not open to all possible interested parties and to the society, as the only three meetings held were restricted to its participants. Public hearings, consultations, presentations or any other instrument of participation or opinion were not available to the public or other stakeholders that were not invited to the forum.

Furthermore, the discussions within the Brazil Connected Forum were unable to change any of the actions proposed by CGPID, neither to add new actions. After the release of the "base-document", the Brazil Connected Forum has never assembled again, and it had no participation in further development of the PNBL.

Differently from the Brazilian experience, the discussion process of the U.S. NBP, as presented in Section 3.2, had a high level of participation from stakeholders. Several instruments were adopted to assure contribution from all interested parties, regardless of

previous invitation, like field hearings and public notices. FCC extensively used the Internet to gather opinions from the general public, through a website, a blog, and even a Twitter account (FCC, 2010).

The comparison reveals that the discussion process of the PNBL could have been more open and transparent to society and to all interested parties. The use of instruments like public consultations or public hearings has been neglected and the few initiatives to discuss PNBL actions were restricted to invited agencies and organizations and were dropped after a short period of time.

The structure and presentation of broadband goals and actions within the PNBL is not restricted to a single document, as revealed in Section 2.4. The principles and objectives of the PNBL were stated in Decree 7.175, the actions proposed by CGPID were fixed in the "base-document," the goals for broadband deployment were established in the Pluriannual plan, and the federal government adopted actions that were not present in any of these documents, like the agreement with fixed telephony concessionaires.

The American experience in designing a broadband plan led to a single document that included a diagnosis of broadband deployment in the country and proposed actions and goals to increase broadband penetration and adoption rates. It revealed an integrated strategy to address broadband policies, covering the many dimensions of a typical national broadband plan, as shown in Section 1.3.

In that sense, the comparison shows that the PNBL is not a broadband plan with an integrated view of objectives, actions and goals, but a sparse set of documents that established each of these in different time frames. PNBL became a "brand" for different broadband policies adopted by the federal government, even if they were not included in any of the PNBL planning documents, like the agreement with fixed telephony concessionaires.

Therefore, the PNBL could benefit from a broad revision of its objectives, actions and goals, so as to become a real planning instrument for broadband policies to be adopted by the government.

On the proposed actions in the PNBL and the U.S. NBP, these plans differ on the focus adopted. While Brazil struggles to build broadband networks in order to reduce its penetration gap, U.S. is more concerned in increasing its adoption rates. As a consequence, the PNBL concentrated its actions on the increase of broadband coverage, and the U.S. NBP had a strong focus on policies to maximize the use of broadband.

The U.S. NBP addressed recommendations towards broadband applications and digital literacy, in order to create demand for the broadband infrastructure that has already been built, along with policies directed to an efficient allocation of broadband infrastructure resources and to competition, guaranteeing the availability of networks for the increased demand.

The PNBL directed all of its actions to three objectives: the reduction of services rates, the increase of broadband coverage and the increase of broadband speed. Even though the concern with infrastructure and prices is consistent with the Brazilian reality, policies for broadband applications and digital literacy were timidly addressed.

Considering that only the supply of broadband networks is not sufficient to ensure their adoption, and to avoid the situation found in U.S., where penetration rates were high but adoption rates were low, the PNBL should incorporate actions directed to stimulate not only the supply, but also the demand for broadband, aiming at applications and digital literacy programs. This would ensure the efficiency of broadband policies, in the sense that they should produce social and economic benefits.

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ANNEX 1

Broadband actions of the Ministry of Communications 2009 broadband plan proposal

Guidelines for stimulating competition
- Assemble fiber optics infrastructures possessed by government-owned companies to create, in the short run, a new national backbone, in order to supply network access wholesale services.
- Implement Internet Exchange Points (IXP) in all municipalities with more than 100,000 inhabitants.
- Increase by ten times the minimum broadband subscription speed until 2014.
- Grant new cable TV concessions, in order to increase by at least 25% the number of broadband subscriptions served by cable infrastructure, and also to increase the number of municipalities served by cable infrastructure.
- Include duct and fiber optics as obligatory items to be included in public works, e.g. transportation, housing, sanitation and energy.
Guidelines for financing telecommunications
- Offer BNDES financing to broadband expansion projects, either through fixed or wireless technologies.
- Offer BNDES financing to digital inclusion projects using broadband aimed at municipalities, specially "digital cities" program.
- Offer BNDES financing to disseminate and formalize cybercafés ("LAN houses").
- Offer training and support to small enterprises, so as they will be able to provide broadband-plan-compliant services.
- Authorize the use of FUST and FUNTTEL (telecommunications technological development fund) resources.
Guidelines for reducing the tax burden
- Reduce taxes on broadband goods and services, in the same way as the Computer for All program.
- Extend to all states the sales tax cut for broadband subscriptions.
- Include small broadband providers in the tax simplification program for small businesses ("Simples").
- Reduce broadband service authorization prices and oversight taxes paid by broadband operators.
- Reduce taxes on broadband network equipment.
Guidelines for regulation
- Include goals for increasing the backhaul capacity in the new PGMU.
- Stimulate competition in broadband supply, by reducing entry barriers. The revision of regulations on intercarrier compensation, network sharing, interconnection, and significant market power, may introduce new regulatory measures aimed at favoring market entry.
- Prevent tying sales of broadband and other telecommunications services, through integrated actions of the Ministry of Communications, Anatel, antitrust agencies and costumer protection agencies.
- Prioritize regulations on network neutrality and quality of broadband service.
- Extinguish limitations to the number of cable TV concessions to be granted.
- Extend 3G coverage to all Brazilian municipalities.
- Allocate funds to map and georeference broadband network resources, as a tool for planning, monitoring and evaluating the National Broadband Plan.
Guidelines for spectrum management
- In broadband spectrum actions, divide frequency blocks so as to enable the participation of large, medium and small operators, by segmenting the Brazilian territory in different coverage areas (national, regional or local, or only regional or local), and imposing maximum limits for bidder's revenue in each kind of coverage.
- In broadband spectrum auctions, introduce new evaluation criteria, such as extended coverage, measures to foster competition, and maximum service rates.
- Allocate frequency blocks in the 3.5 GHz range to government-owned companies in order to perform digital inclusion actions.
Guidelines for federal government programs
- Maintain the Computer for All Program (including modems) and the benefits of Law nr 11.196 (tax cut on data transmission equipment).
- Expand the GESAC Program to attend rural and frontier areas, and evaluate investment in the Brazilian Satellite project.
- Implement actions to make fiber optics infrastructures possessed by government-owned companies available to exclusively supply network access wholesale services.
- Integrate the management of the data network demand of the federal government.
Guidelines for fomenting "digital cities"
- Articulate among federal, state and local governments initiatives aimed at "digital cities," considering existent policies.
- Stimulate the participation of the Third Sector in "digital cities" programs, including the implementation of public access centers.
- Disseminate Wi-Fi hotspots based in public or private collective subscriptions (e.g., schools, libraries, firms).
Guidelines for telecenters
- Install 100,000 new public telecenters until 2014.
- Expand the National Project of Support to Telecenters to cover all newly installed telecenters.
- Make periodic trainings for telecenter tutors, with one training per year until 2014.
- Establish common rules for use of telecenters, based on the guidelines of the National Project of Support to Telecenters.
- Allocate part of the National Project of Support to Telecenters funds to inform attended communities about telecenters.
Guidelines for industrial and technological development
- Stimulate the establishment of a large network equipment supplier, using Brazilian technology, through the allocation of funds to capitalize and finance this firm, and to perform broadband technologies R&D.
- Implementation of the Advanced Productivity Process, using software to evaluate the granting of the fiscal incentives created by Law nr 8.248/1991, as amended (competition in the informatics sector).

Source: MC (2009).

ANNEX 2

Participating entities of the Brazil Connected Forum (Fórum Brasil Conectado)

1	Chief of Staff of the Presidency
2	Personal office of the President
3	Ministry of Science and Technology
4	Ministry of Culture
5	Ministry of Education
6	Ministry of Finance
7	Ministry of Health
8	Ministry of Communications
9	Ministry of Development, Industry and Trade
10	Ministry of Planning, Budget and Management
11	Secretariat of Strategic Affairs of the Presidency
12	Secretariat of Social Communication of the Presidency
13	Chamber of Deputies
14	Federal Senate
15	National Bank for Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES)
16	Brazilian Association of State-owned Data Processing Companies (Associação Brasileira de Empresas Estaduais de Processamento de Dados – ABEP)
17	National Council of Treasury Policy (Conselho Nacional de Política Fazendária - CONFAZ)
18	National Council of Heads of State Planning Departments (Conselho Nacional de Secretários Estaduais do Planejamento - CONSEPLAN)
19	National Council of Heads of State Science, Technology and Innovation Departments (Conselho Nacional de Secretários Estaduais para assuntos de CT&I - CONSECTI)
20	Brazilian Association of Municipalities (Associação Brasileira de Municípios - ABM)
21	Brazilian Association of Municipal ICT Entities (Associação Brasileira de Entidades Municipais de TIC - ABEMTIC)
22	National Confederation of Municipalities (Confederação Nacional de Municípios - CNM)
23	Forum of Heads of Municipal Science and Technology Departments (Fórum de Secretários Municipais de C&T - FNSDMCTI)
24	National Front of Mayors (Frente Nacional de Prefeitos - FNP)
25	Telecomunicações do Brasil S.A. - Telebrás
26	National Telecommunications Agency (Agência Nacional de Telecomunicações - ANATEL)
27	National Council of Justice (Conselho Nacional de Justiça - CNJ)
28	Institute of Applied Economics Research (Instituto de Pesquisa Econômica Aplicada - IPEA)
29	National Network of Teaching and Research (Rede Nacional de Ensino e Pesquisa - RNP)
30	Steering Committee of the Internet in Brazil (Comitê Gestor da Internet no Brasil - CGI.Br)
31	National Association of Research and Development of Innovative Companies (Associação Nacional de Pesquisa e Desenvolvimento das Empresas Inovadoras - ANPEI)
32	Brazilian Society for the Progress of Science (Sociedade Brasileira para o Progresso da Ciência - SBPC)
33	1 representative of scientific societies (of Microelectronics; of Computation; of Telecommunications; others)
34	Center of Research and Development (Centro de Pesquisa e Desenvolvimento - CPqD)
35	Brazilian Association of the Electric and Electronics Industry (Associação Brasileira da Indústria Elétrica e Eletrônica - ABINEE)
36	Brazilian Association of ICT Companies (Associação Brasileira de Empresas de Tecnologia da Informação e Comunicação - BRASSCOM)
37	Association of Information Technology, Software and Internet Brazilian Companies (Associação das Empresas Brasileiras de Tecnologia da Informação, Software e Internet - ASSESPRO NACIONAL)
38	Gente Consortium (Consórcio Gente)
39	Brazilian Association of Consumer Protection (Associação Brasileira de Defesa do Consumidor - PRO TESTE)
40	Brazilian Institute of Consumer Protection (Instituto Brasileiro de Defesa do Consumidor - IDEC)
41	National Forum for the Democratization of Communications (Fórum Nacional pela Democratização da Comunicação - FNDC)
42	Brazilian Association of Competitive Telecommunications Operators (Associação Brasileira das Prestadoras de Serviços de Telecomunicações Competitivas - TELCOMP)
43	Brazilian Association of Pay TV (Associação Brasileira de TV por Assinatura - ABTA)
44	Brazilian Association of Internet Providers and Multimedia Data Communications Operators (Associação Brasileira dos Provedores de Internet e Operadores de Comunicação de Dados Multimídia - ABRAMULTI) (member) Brazilian Association of Internet and Telecommunications Small Providers (Associação Brasileira de Pequenos Provedores de Internet e Telecomunicações - ABRAPPIT) (alternative member)
45	Brazilian Association of Internet Access, Services and Information Providers (Associação Brasileira dos Provedores de Acesso, Serviços e Informações da Rede Internet - ABRANET) (member) Internet South (Internet Sul) (alternative member)

46	National Association of Cell Phone Operators (Associação Nacional das Operadoras Celulares - ACEL)
47	Brazilian Association of Fixed Telephony Concessionaires (Associação Brasileira de Concessionárias de Serviço Telefônico Fixo Comutado - ABRAFIX)
48	National Union of Fixed and Mobile Telephony Operators (Sindicato Nacional das Empresas de Telefonia e de Serviço Móvel Celular e Pessoal - SINDITELEBRASIL)
49	Social Technologies Network (Rede de Tecnologias Social - RTS)
50	Brazilian Association of Radio and TV Operators (Associação Brasileira de Emissoras de Rádio e Televisão - ABERT)
51	Brazilian Association of Broadcasters (Associação Brasileira de Radiodifusores - ABRA)
52	National Association of Heads of Federal Higher Education Institutions (Associação Nacional dos Dirigentes das Instituições Federais de Ensino Superior - ANDIFES)
53	Brazilian Association of Independent TV Producers (Associação Brasileira dos Produtores Independentes de Televisão - ABPI-TV)
54	Brazilian Association of Electronic Games Developers (Associação Brasileira das Desenvolvedoras de Jogos Eletrônicos - ABRAGAMES)
55	Brazilian Digital Culture Forum (Fórum da Cultura Digital Brasileira - CulturaDigitalBR)
56	Brazil Music Fair (Feira Música Brasil)

ANNEX 3

List of workshops and field hearings held by FCC when drafting the U.S. NBP

	Event	Data	Location
1	E-Gov/Civic Engagement Workshop	8/6/2009	Federal Communications Commission
2	Deployment: Wired-General Workshop	8/12/2009	Federal Communications Commission
3	Deployment: Wireless-General Workshop	8/12/2009	Federal Communications Commission
4	Deployment: Unserved-Underserved Workshop	8/12/2009	Federal Communications Commission
5	Technology/Fixed Broadband Workshop	8/13/2009	Federal Communications Commission
6	Technology/Wireless Workshop	8/13/2009	Federal Communications Commission
7	International Lessons Workshop	8/18/2009	Federal Communications Commission
8	Opportunities for Small and Disadvantaged Businesses Workshop	8/18/2009	Federal Communications Commission
9	Building the Fact Base: The State of Broadband Adoption and Utilization Workshop	8/19/2009	Federal Communications Commission
10	Low Adoption and Utilization: Importance of Broadband and Applications Workshop	8/19/2009	Federal Communications Commission
11	Programmatic Efforts to Increase Broadband Adoption and Usage: What Works and What Doesn't Workshop	8/19/2009	Federal Communications Commission
12	Broadband Opportunities for People with Disabilities Workshop	8/20/2009	Federal Communications Commission
13	Education Workshop	8/20/2009	Federal Communications Commission
14	Public Safety and Homeland Security Workshop	8/25/2009	Federal Communications Commission
15	Smart Grid, Broadband and Climate Change Workshop	8/25/2009	Federal Communications Commission
16	Economic Growth, Job Creation and Private Investment Workshop	8/26/2009	Federal Communications Commission
17	Job Training Workshop	8/26/2009	Federal Communications Commission
18	Technology/Applications and Devices Workshop	8/27/2009	Federal Communications Commission
19	State and Local Governments: Toolkits and Best Practices Workshop	9/1/2009	Federal Communications Commission
20	Benchmarks Workshop	9/2/2009	Federal Communications Commission
21	Big Ideas with Potential to Substantially Change the Internet Workshop	9/3/2009	Federal Communications Commission
22	Broadband Consumer Context Workshop	9/9/2009	Federal Communications Commission
23	Health Care Workshop	9/15/2009	Federal Communications Commission
24	The Role of Content in the Broadband Ecosystem	9/17/2009	Federal Communications Commission
25	Spectrum Workshop	9/17/2009	Federal Communications Commission
26	Public Field Hearing, National Broadband Plan, FCC Commissioner Meredith Atwell Baker	9/21/2009	The Thompson Conference Center, TCC 3.108 2045 Robert Dedman Drive - Austin, Texas
27	Cybersecurity Workshop	9/30/2009	Federal Communications Commission
28	FCC Hearing on Capital Formation in the Broadband Sector	10/1/2009	Federal Communications Commission
29	Diversity and Civil Rights Issues In Broadband Deployment and Adoption Workshop	10/2/2009	Federal Communications Commission
30	FCC Hearing on Broadband Adoption, Commissioners Mignon Clyburn and Michael Copps	10/6/2009	Trident Technical College - Palmer Campus 66 Columbus St. - Charleston, S.C.
31	FCC Field Hearing: Mobile Applications and Spectrum	10/8/2009	Univ. of San Diego 5998 Alcala Park - San Diego, Calif.
32	Economic Issues in Broadband Competition Workshop	10/9/2009	Federal Communications Commission
33	Broadband Accessibility for People with Disabilities II: Barriers, Opportunities and Policy Recommendations Workshop	10/20/2009	Federal Communications Commission

34	FCC Field Hearing on Broadband Access for People with Disabilities	11/6/2009	Gallaudet University Kellogg Conference Center 800 Florida Ave. N.E. - Washington, D.C.
35	FCC Broadband Field Hearing on Improving Public Safety Communications and Emergency Response	11/12/2009	Georgetown University - Leavey Center 3800 Reservoir Road N.W. - Washington, D.C.
36	Capitalization Strategies for Small and Disadvantaged Businesses Workshop	11/12/2009	Federal Communications Commission
37	Future Fiber Architectures and Local Deployment Choices Workshop	11/19/2009	Federal Communications Commission
38	Research Recommendations for the Broadband Taskforce Workshop	11/23/2009	Federal Communications Commission
39	FCC Field Hearing on Energy and the Environment	11/30/2009	MIT Stratton Student Center - Twenty Chimneys 84 Massachusetts Ave. - Cambridge, Mass.
40	Lessons for the National Broadband Plan from Local Officials Representing Underserved Communities Workshop	12/9/2009	Federal Communications Commission
41	Global Broadband Connects America and the World: Infrastructure, Services and Applications Workshop	12/10/2009	Federal Communications Commission
42	Review and Discussion of Broadband Deployment Research Workshop	12/10/2009	Federal Communications Commission
43	FCC Field Hearing on Digital Inclusion	12/14/2009	National Civil Rights Museum Rose Room 450 Mulberry St. - Memphis, Tenn.
44	FCC Broadband Field Hearing on Small Business	12/21/2009	Univ. of Chicago - Gleacher Center 450 N. Cityfront Plaza Drive - Chicago, Ill.
45	Broadband and New Media Strategies for Minority Radio Workshop	1/26/2010	Federal Communications Commission

Source: FCC (2010)

ANNEX 4

List of public notices released by FCC within the drafting process of the U.S. NBP

Public Notice nr	Title	Release Date	Comment Dates	Reply Comment Dates	Document Number / Link
	Process for Filing Response to Staff Workshops	9/1/2009	Three dates: (9/15/2009, 10/2/2009, and 10/20/2009) Depending on Date of Workshop		DA 09-1992
1	Definition of Broadband	8/20/2009	08/31/09	09/08/09	DA 09-1842
2	Implementation of Smart Grid Technology	9/4/2009	10/02/09	n/a	DA 09-2017
3	Telework	9/4/2009	09/22/09	n/a	DA 09-2018
4	Broadband Accesibility for People With Disabilities Workshop II: Barriers, Opportunities, and Policy Recommendations	9/18/2009	10/06/09	n/a	DA 09-2080
5	Broadband Deployment and Adoption on Tribal Lands	9/23/2009	11/9/09	12/9/2009	DA 09-2093
6	Spectrum for Broadband	9/23/2009	10/23/09	11/13/2009	DA 09-2100
7	Contribution of Federal, State, Tribal, and Local Government to Broadband	9/25/2009	11/06/09	n/a	DA 09-2122
8	Public Safety, Homeland Security, and Cybersecurity	9/28/2009	11/12/09	n/a	DA 09-2133
9	Opportunities for Disadvantaged Businesses in the Age of Broadband	9/28/2009	11/02/09	n/a	DA 09-2137
10	Broadband Clearinghouse	10/02/2009	11/16/2009	n/a	DA 09-2167
11	Middle Mile	10/08/2009	11/04/2009	n/a	DA 09-2186
12	Connecting Anchor Institutions to Fiber	10/08/2009	10/28/2009	n/a	DA 09-2194
13	Berkman Center for Internet and Society Study	10/14/2009	11/16/2009	n/a	DA 09-2217
14	Public Safety Issues Related to Broadband Deployment in Rural and Tribal Areas and Broadband Communications to and from Persons with Disabilities	11/2/2009	12/1/2009	n/a	DA 09-2369

15	Broadband Needs in Education, Including Changes to E-Rate Program to Improve Broadband Deployment	11/3/2009	11/20/2009	12/11/2009	DA 09-2376
16	Broadband Adoption	11/10/2009	12/2/2009	n/a	DA 09-2403
17	Health Care Delivery Elements of the National Broadband Plan	11/12/2009	12/4/2009	n/a	DA 09-2413
18	Relationship Between Broadband and Economic Opportunity	11/12/2009	12/4/2009	n/a	DA 09-2414
19	The Role of Universal Service and Intercarrier Compensation in the National Broadband Plan	11/13/2009	12/7/2009	n/a	DA 09-2419
20	Moving Toward a Digital Democracy	11/17/2009	12/10/2009	n/a	DA 09-2431
21	Data Portability and its Relationship to Broadband	11/18/2009	12/9/2009	n/a	DA 09-2433
22	Research Necessary for Broadband Leadership	11/18/2009	12/8/2009	n/a	DA 09-2434
23	Network Deployment Study Conducted by the Columbia Institute for Tele-Information	11/20/2009	12/4/2009	n/a	DA 09-2458
24	Broadband Measurement and Consumer Transparency of Fixed Residential and Small Business Services in the U.S.	11/24/2009	12/14/2009	n/a	DA 09-2474
25	Transition from Circuit-Switched Network to All-IP Network	12/1/2009	12/21/2009	n/a	DA 09-2517
26	Uses of Spectrum	12/2/2009	12/21/2009	n/a	DA 09-2518
27	Video Device Innovation	12/3/2009	12/21/2009	n/a	DA 09-2519
28	Broadband Deployment Financing	12/18/2009	1/8/2010	n/a	DA 09-2610
29	Privacy Issues	1/13/2010	1/22/2010	n/a	DA 10-62
30	Reply Comments	1/13/2010	1/27/2010	n/a	DA 10-61

Source: FCC's broadband website, at <http://blog.broadband.gov/?ArticleTitle=Public%20Notices%20for%20the%20Omnibus%20Broadband%20Intiative>.

ANNEX 5

Complete U.S. NBP recommendations

Broadband Competition And Innovation Policy

Networks

- The federal government, including the FCC, the National Telecommunications and Information Administration (NTIA) and Congress, should make more spectrum available for existing and new wireless broadband providers in order to foster additional wireless-wireline competition at higher speed tiers.

- The FCC and the U.S. Bureau of Labor Statistics (BLS) should collect more detailed and accurate data on actual availability, penetration, prices, churn and bundles offered by broadband service providers to consumers and businesses, and should publish analyses of these data.

- The FCC, in coordination with the National Institute of Standards and Technology (NIST), should establish technical broadband performance measurement standards and methodology and a process for updating them. The FCC should also encourage the formation of a partnership of industry and consumer groups to provide input on these standards and this methodology.

- The FCC should continue its efforts to measure and publish data on actual performance of fixed broadband services. The FCC should publish a formal report and make the data available online.

- The FCC should initiate a rulemaking proceeding by issuing a Notice of Proposed Rulemaking (NPRM) to determine performance disclosure requirements for broadband.

- The FCC should develop broadband performance standards for mobile services, multi-unit buildings and small business users.

- The FCC should comprehensively review its wholesale competition regulations to develop a coherent and effective framework and take expedited action based on that framework to ensure widespread availability of inputs for broadband services provided to small businesses, mobile providers and enterprise customers.

- The FCC should ensure that special access rates, terms and conditions are just and reasonable.

- The FCC should ensure appropriate balance in its copper retirement policies.

- The FCC should clarify interconnection rights and obligations, and encourage the shift to IP-to-IP interconnection where efficient.

- The FCC should move forward promptly in the open proceeding on data roaming.

Devices

- The FCC should initiate a proceeding to ensure that all multichannel video programming distributors (MVPDs) install a gateway device or equivalent functionality in all new subscriber homes and in all homes requiring replacement set-top boxes, starting on or before Dec. 31, 2012.

- On an expedited basis, the FCC should adopt rules for cable operators to fix certain CableCARD issues while development of the gateway device functionality progresses. Adoption of these rules should be completed in the fall of 2010.

Applications

- Congress, the Federal Trade Commission (FTC) and the FCC should consider clarifying the relationship between users and their online profiles.

- Congress should consider helping spur development of trusted "identity providers" to assist consumers in managing their data in a manner that maximizes the privacy and security of the information.

- The FCC and FTC should jointly develop principles to require that customers provide informed consent before broadband service providers share certain types of information with third parties.

- The federal government, led by the FTC, should put additional resources into combating identity theft and fraud and help consumers access and utilize those resources, including bolstering existing solutions such as OnGuard Online.

- FCC consumer online security efforts should support broader national online security policy, and should be coordinated with the Department of Homeland Security (DHS), the FTC, the White House Cyber Office and other agencies. Federal agencies should connect their existing websites to OnGuard Online to provide clear consumer online security information and direction.

- The federal government should create an interagency working group to coordinate child online safety and literacy work, facilitate information sharing, ensure consistent messaging and outreach and evaluate the effectiveness of governmental efforts. The working group should consider launching a national education and outreach campaign involving governments, schools and caregivers.
- The federal government should investigate establishing a national framework for digital goods and services taxation.

Spectrum

Ensure greater transparency concerning spectrum allocation and utilization
- The FCC should launch and continue to improve a spectrum dashboard.
- The FCC and the National Telecommunications and Information Administration (NTIA) should create methods for ongoing measurement of spectrum utilization.
- The FCC should maintain an ongoing strategic spectrum plan, including a triennial assessment of spectrum allocations.

Expand incentives and mechanisms to reallocate or repurpose spectrum
- Congress should consider expressly expanding the FCC's authority to enable it to conduct incentive auctions in which incumbent licensees may relinquish rights in spectrum assignments to other parties or to the FCC.
- Congress should consider building upon the success of the Commercial Spectrum Enhancement Act (CSEA) to fund additional approaches to facilitate incumbent relocation.
- Congress should consider granting authority to the FCC to impose spectrum fees on license holders and to NTIA to impose spectrum fees on users of government spectrum.
- The FCC should evaluate the effectiveness of its secondary markets policies and rules to promote access to unused and underutilized spectrum.

Make more spectrum available for broadband within the next 10 years
- The FCC should make 500 megahertz newly available for broadband use within the next 10 years, of which 300 megahertz between 225 MHz and 3.7 GHz should be made newly available for mobile use within five years.
- The FCC should make 20 megahertz available for mobile broadband use in the 2.3 GHz Wireless Communications Service (WCS) band, while protecting neighboring federal, non-federal Aeronautical Mobile Telemetry (AMT) and satellite radio operations.
- The FCC should auction the 10 megahertz Upper 700 MHz D Block for commercial use that is technically compatible with public safety broadband services.
- The FCC should make up to 60 megahertz available by auctioning Advanced Wireless Services (AWS) bands, including, if possible, 20 megahertz from federal allocations.
- The FCC should accelerate terrestrial deployment in 90 megahertz of Mobile Satellite Spectrum (MSS).
- The FCC should initiate a rulemaking proceeding to reallocate 120 megahertz from the broadcast television (TV) bands.

Increase the flexibility, capacity and cost-effectiveness of spectrum for point-to-point wireless backhaul services
- The FCC should revise Parts 74, 78 and 101 of its rules to allow for increased spectrum sharing among compatible point-to-point microwave services.
- The FCC should revise its rules to allow for greater flexibility and cost-effectiveness in deploying wireless backhaul.

Expand opportunities for innovative spectrum access models
- The FCC, within the next 10 years, should free up a new, contiguous nationwide band for unlicensed use.
- The FCC should move expeditiously to conclude the TV white spaces proceeding.
- The FCC should spur further development and deployment of opportunistic uses across more radio spectrum.
- The FCC should initiate proceedings to enhance research and development that will advance the science of spectrum access.

Take additional steps to make U.S. spectrum policy more comprehensive
- The FCC and NTIA should develop a joint roadmap to identify additional candidate federal and non-federal spectrum that can be made accessible for both mobile and fixed wireless broadband use, on an exclusive, shared, licensed and/or unlicensed basis.
- The FCC should promote within the International Telecommunication Union (ITU) innovative and flexible approaches to global spectrum allocation that take into consideration convergence of various radio communication services and that enable global development of broadband services.
- The FCC should take into account the unique spectrum needs of U.S. Tribal communities when implementing these recommendations.

Infrastructure

Improving utilization of infrastructure
- The FCC should establish rental rates for pole attachments that are as low and close to uniform as possible, consistent with Section 224 of the Communications Act of 1934, as amended, to promote broadband deployment.
- The FCC should implement rules that will lower the cost of the pole attachment "make-ready" process.
- The FCC should establish a comprehensive timeline for each step of the Section 224 access process and reform the process for resolving disputes regarding infrastructure access.
- The FCC should improve the collection and availability of information regarding the location and availability of poles, ducts, conduits and rights-of-way.
- Congress should consider amending Section 224 of the Act to establish a harmonized access policy for all poles, ducts, conduits and rights-of-way.
- The FCC should establish a joint task force with state, Tribal and local policymakers to craft guidelines for rates, terms and conditions for access to public rights-of-way.

Maximizing impact of federal resources
- The U.S. Department of Transportation (DOT) should make federal financing of highway, road and bridge projects contingent on states and localities allowing joint deployment of conduits by qualified parties.
- Congress should consider enacting "dig once" legislation applying to all future federally funded projects along rights-of-way (including sewers, power transmission facilities, rail, pipelines, bridges, tunnels and roads).
- Congress should consider expressly authorizing federal agencies to set the fees for access to federal rights-of-way on a management and cost recovery basis.
- The Executive Branch should develop one or more master contracts to expedite the placement of wireless towers on federal government property and buildings.

Research And Development

- The government should focus broadband R&D funding on projects with varied risk-return profiles, including a mix of short-term and long-term projects (e.g., those lasting 5 years or longer).
- Congress should consider making the Research and Experimentation (R&E) tax credit a long-term tax credit to stimulate broadband R&D.
- The federal government should provide ultra-high-speed broadband connectivity to select DoD installations to enable the

development of next-generation broadband applications.

- The National Academy of Sciences and the National Academy of Engineering (National Academies) should develop a research road map to guide federal R&D funding priorities.

- NSF should establish an open, multi-location, interdisciplinary research center for broadband, addressing technology, policy and economics. Center priorities should be driven by the agenda identified in the National Academies research road map.

- NSF, in consultation with the Federal Communications Commission (FCC), should consider funding a wireless testbed for promoting the science underlying spectrum policymaking and a testbed for evaluating the network security needed to provide a secure broadband infrastructure.

- The FCC should start a rulemaking process to establish more flexible experimental licensing rules for spectrum and facilitate the use of this spectrum by researchers.

Availability

The FCC should conduct a comprehensive reform of universal service and intercarrier compensation in three stages to close the broadband availability gap.

Stage One: Lay the foundation for reform (2010-2011)

- The FCC should improve Universal Service Fund (USF) performance and accountability.

- The FCC should create the Connect America Fund (CAF).

- The FCC should create the Mobility Fund.

- The FCC should design new USF funds in a tax-efficient manner to minimize the size of the gap.

- Throughout the USF reform process, the FCC should solicit input from Tribal governments on USF matters that impact Tribal lands.

- The FCC should take action to shift up to $15.5 billion over the next decade from the current High-Cost program to broadband through common-sense reforms.

- The FCC should adopt a framework for long-term intercarrier compensation (ICC) reform that creates a glide path to eliminate per-minute charges while providing carriers an opportunity for adequate cost recovery, and establish interim solutions to address arbitrage.

- The FCC should examine middle-mile costs and pricing.

Stage Two: Accelerate reform (2012-2016)

- The FCC should begin making disbursements from the CAF.

- The FCC should broaden the universal service contribution base.

- The FCC should begin a staged transition of reducing per-minute rates for intercarrier compensation.

Stage Three: Complete the transition (2017-2020)

- The FCC should manage the total size of the USF to remain close to its current size (in 2010 dollars) in order to minimize the burden of increasing universal service contributions on consumers.

- The FCC should eliminate the legacy High-Cost program, with all federal government funding to support broadband availability provided through the CAF.

- The FCC should continue reducing ICC rates by phasing out per-minute rates for the origination and termination of telecommunications traffic.

Accelerating broadband deployment

- To accelerate broadband deployment, Congress should consider providing optional public funding to the Connect America Fund, such as a few billion dollars per year over a two to three year period.

Congress should consider providing other grants, loans and loan guarantees

- Congress should consider expanding combination grant-loan programs.

- Congress should consider expanding the Community Connect program.

- Congress should consider establishing a Tribal Broadband Fund to support sustainable broadband deployment and adoption on Tribal lands, and all federal agencies that upgrade connectivity on Tribal lands should coordinate such upgrades with Tribal governments and the Tribal Broadband Fund grant-making process.

Government should facilitate Tribal, state, regional and local broadband initiatives

- Congress should make clear that state, regional and local governments can build broadband networks.

- Federal and state policies should facilitate demand aggregation and use of state, regional and local networks when that is the most cost-efficient solution for anchor institutions to meet their connectivity needs.

- Congress should consider amending the Communications Act to provide discretion to the FCC to allow anchor institutions on Tribal lands to share broadband network capacity that is funded by the E-rate or the Rural Health Care program with other community institutions designated by Tribal governments.

- The federal government and state governments should develop an institutional framework that will help America's anchor institutions obtain broadband connectivity, training, applications and services.

Adoption And Utilization

Address cost barriers to broadband adoption and utilization

- The Federal Communications Commission (FCC) should expand Lifeline Assistance (Lifeline) and Link-Up America (Link-Up) to make broadband more affordable for low-income households.

- The FCC should consider free or very low-cost wireless broadband as a means to address the affordability barrier to adoption.

Address digital literacy barriers to broadband adoption and utilization

- The federal government should launch a National Digital Literacy Program that creates a Digital Literacy Corps, increases the capacity of digital literacy partners and creates an Online Digital Literacy Portal.

Address relevance barriers to broadband adoption and utilization

- The National Telecommunications and Information Administration (NTIA) should explore the potential for public-private partnerships to improve broadband adoption by working with other federal agencies.

- Public and private partners should prioritize efforts to increase the relevance of broadband for older Americans.

- The federal government should explore the potential of mobile broadband access as a gateway to inclusion.

- The private sector and non-profit community should partner to conduct a national outreach and awareness campaign.

Address issues of accessibility for broadband adoption and utilization

- The Executive Branch should convene a Broadband Accessibility Working Group (BAWG) to maximize broadband adoption by people with disabilities.

- The FCC should establish an Accessibility and Innovation Forum.

- Congress, the FCC and the U.S. Department of Justice (DOJ) should consider modernizing accessibility laws, rules and related subsidy programs.

Expand federal support for regional broadband capacity-building, program evaluation and sharing of best practices

- Federal support should be expanded for regional capacity-building efforts aimed at improving broadband deployment and adoption.
- Congress and federal agencies should promote third-party evaluation of future broadband adoption programs.
- NTIA should establish a National Broadband Clearinghouse to promote best practices and information sharing.

Coordinate with Tribes on broadband issues

- The Executive Branch, the FCC and Congress should make changes to ensure effective coordination and consultation with Tribes on broadband-related issues.

Health Care

Create appropriate incentives for e-care utilization.

- Congress and the Secretary of Health and Human Services (HHS) should consider developing a strategy that documents the proven value of e-care technologies, proposes reimbursement reforms that incent their meaningful use and charts a path for their widespread adoption.

Modernize regulation to enable health IT adoption.

- Congress, states and the Centers for Medicare & Medicaid Services (CMS) should consider reducing regulatory barriers that inhibit adoption of health IT solutions.
- The FCC and the Food and Drug Administration (FDA) should clarify regulatory requirements and the approval process for converged communications and health care devices.

Unlock the value of data.

- The Office of the National Coordinator for Health Information Technology (ONC) should establish common standards and protocols for sharing administrative, research and clinical data, and provide incentives for their use.
- Congress should consider providing consumers access to—and control over—all their digital health care data in machine-readable formats in a timely manner and at a reasonable cost.

Ensure sufficient connectivity for health care delivery locations.

- The FCC should replace the existing Internet Access Fund with a Health Care Broadband Access Fund.
- The FCC should establish a Health Care Broadband Infrastructure Fund to subsidize network deployment to health care delivery locations where existing networks are insufficient.
- The FCC should authorize participation in the Health Care Broadband Funds by long-term care facilities, off-site administrative offices, data centers and other similar locations. Congress should consider providing support for for-profit institutions that serve particularly vulnerable populations.
- To protect against waste, fraud and abuse in the Rural Health Care Program, the FCC should require participating institutions to meet outcomes-based performance measures to qualify for Universal Service Fund (USF) subsidies, such as HHS's meaningful use criteria.
- Congress should consider authorizing an incremental sum (up to $29 million per year) for the Indian Health Service (IHS) for the purpose of upgrading its broadband service to meet connectivity requirements.
- The FCC should periodically publish a Health Care Broadband Status Report.

Education

Support and promote online learning

- The U.S. Department of Education, with support from the National Institute of Standards and Technology (NIST) and the Federal Communications Commission (FCC), should establish standards to be adopted by the federal government for locating, sharing and licensing digital educational content by March 2011.
- The federal government should increase the supply of digital educational content available online that is compatible with standards established by the U.S. Department of Education.
- The U.S. Department of Education should periodically re-examine the digital data and interoperability standards it adopts to ensure that they are consistent with the needs and practices of the educational community, including local, state and non-profit educational agencies and the private sector.
- Congress should consider taking legislative action to encourage copyright holders to grant educational digital rights of use, without prejudicing their other rights.
- State accreditation organizations should change kindergarten through twelfth grade (K–12) and post-secondary course accreditation and teacher certification requirements to allow students to take more courses for credit online and to permit more online instruction across state lines.
- The U.S. Department of Education and other federal agencies should provide support and funding for research and development of online learning systems.
- The U.S. Department of Education should consider investment in open licensed and public domain software alongside traditionally licensed solutions for online learning solutions, while taking into account the long-term effects on the marketplace.
- The U.S. Department of Education should establish a program to fund the development of innovative broadband-enabled online learning solutions.
- State education systems should include digital literacy standards, curricula and assessments in their English Language Arts and other programs, as well as adopt online digital literacy and programs targeting STEM.
- The U.S. Department of Education should provide additional grant funding to help schools train teachers in digital literacy and programs targeting STEM. States should expand digital literacy requirements and training programs for teachers.

Unlock the value of data and improve transparency

- The U.S. Department of Education should encourage the adoption of standards for electronic educational records.
- The U.S. Department of Education should develop digital financial data transparency standards for education. It should collaborate with state and local education agencies to encourage adoption and develop incentives for the use of these standards.
- The U.S. Department of Education should provide a simple Request for Proposal (RFP) online "broadcast" service where vendors can register to receive RFP notifications from local or state educational agencies within various product categories.

Modernizing educational broadband infrastructure

- The FCC should adopt its pending Notice of Proposed Rulemaking (NPRM) to remove barriers to off-hours community use of E-rate funded resources.
- The FCC should initiate a rulemaking to set goals for minimum broadband connectivity for schools and libraries and prioritize funds accordingly.
- The FCC should provide E-rate support for internal connections to more schools and libraries.
- The FCC should give schools and libraries more flexibility to purchase the lowest-cost broadband solutions.
- The FCC should initiate a rulemaking to raise the cap on funding for E-rate each year to account for inflation.

- The FCC should initiate a rulemaking to streamline the E-rate application process.
- The FCC should collect and publish more specific, quantifiable and standardized data about applicants' use of E-rate funds.
- The FCC should work to make overall broadband-related expenses more cost-efficient within the E-rate program.
- Congress should consider amending the Communications Act to help Tribal libraries overcome barriers to E-rate eligibility arising from state laws.
- The FCC should initiate a rulemaking to fund wireless connectivity to portable learning devices. Students and educators should be allowed to take these devices off campus so they can continue learning outside school hours.
- The FCC should award some E-rate funds competitively to programs that best incorporate broadband connectivity into the educational experience.
- Congress should consider providing additional public funds to connect all public community colleges with high-speed broadband and maintain that connectivity.

Energy And The Environment

Integrate broadband into the Smart Grid

- The FCC should start a proceeding to explore the reliability and resiliency of commercial broadband communications networks.
- States should reduce impediments and financial disincentives to using commercial service providers for Smart Grid communications.
- The North American Electric Reliability Corporation (NERC) should clarify its Critical Infrastructure Protection (CIP) security requirements.
- Congress should consider amending the Communications Act to enable utilities to use the proposed public safety 700 MHz wireless broadband network.
- The NTIA and the FCC should continue their joint efforts to identify new uses for federal spectrum and should consider the requirements of the Smart Grid.
- The U.S. Department of Energy (DOE), in collaboration with the FCC, should study the communications requirements of electric utilities to inform federal Smart Grid policy.

Unleash innovation in smart homes and smart buildings

- States should require electric utilities to provide consumers access to, and control of, their own digital energy information, including real-time information from smart meters and historical consumption, price and bill data over the Internet. If states fail to develop reasonable policies over the next 18 months, Congress should consider national legislation to cover consumer privacy and the accessibility of energy data.
- The Federal Energy Regulatory Commission (FERC) should adopt consumer digital data accessibility and control standards as a model for states.
- DOE should consider consumer data accessibility policies when evaluating Smart Grid grant applications, report on the states' progress toward enacting consumer data accessibility and develop best practice guidance for states.
- The Rural Utilities Services (RUS) should make Smart Grid loans to rural electric cooperatives a priority, including integrated Smart Grid-broadband projects. RUS should favor Smart Grid projects from states and utilities with strong consumer data accessibility policies.

Accelerate sustainable ICT

- The FCC should start a proceeding to improve the energy efficiency and environmental impact of the communications industry.
- The federal government should take a leadership role in improving the energy efficiency of its data centers.

Economic Opportunity

Support entrepreneurship and America's small and medium-sized businesses

- Small Business Administration (SBA) resource partner programs should provide enhanced information technology (IT) applications training.
- Current federal small and medium enterprise (SME) support programs should use broadband and online applications to scale their services and give small businesses access to a virtual nationwide network of experts.
- The government should develop a public-private partnership to provide technology training and tools for small disadvantaged businesses (SDBs) and SMEs in low-income areas.
- Congress should consider additional funds for the Economic Development Administration (EDA) to bolster entrepreneurial development programs with broadband tools and training.

Deliver high quality federally-supported job training and placement services virtually

- The Department of Labor (DOL) should accelerate and expand efforts to create a robust online platform that delivers virtual employment assistance programs and facilitates individualized job training.

Remove barriers and promote telework within the federal government

- Congress should consider eliminating tax and regulatory barriers to telework.
- The federal government should promote telework internally.

Enable local and regional economic development

- The federal government should develop regional and community broadband benchmarks for use as a central component within economic development planning and programs.
- EDA should create an easy-to-use, dynamic online information center that gives regional development managers access to integrated federal, state, local and Tribal data.
- The National Science Foundation (NSF) should use its technology transfer grants to spur regional innovation and development as well as greater collaboration across universities.

Government Performance

Improve connectivity through government action

- Federal government agencies and departments should serve as broadband anchor tenants for unserved and underserved communities.
- When feasible, Congress should consider allowing state and local governments to get lower service prices by participating in federal contracts for communications services.
- The Office of Management and Budget (OMB) should review and coordinate federal grants that have a broadband connectivity requirement. Federal government grant funding should not limit or permit limitations on the use of federally funded facilities or services for broadband deployment, except when technology solutions cannot ensure privacy or security of data.
- The Executive Branch and Congress should consider using federal funding to encourage cities and counties to gather information on initiatives enabled by broadband in ways that allow for rigorous evaluation and lead to an understanding of best practices.

Enhance internal government efficiency

- OMB should develop a vision and strategy to guide agencies on cloud computing.

- OMB and the Federal Chief Information Officers (CIO) Council should develop a competition to annually recognize internal efforts to transform government using broadband-enabled technologies.
- The Executive Branch should create an interagency working group, comprised of the senior grants officials from each agency, to implement guidelines and requirements for interagency coordination of grants and to improve Grants.gov to make it easier for applicants to use.
- The Federal CIO Council should accelerate agency adoption of social media technologies for internal use.

Strengthen cybersecurity

- The Executive Branch, in collaboration with relevant regulatory authorities, should develop machine-readable repositories of actionable real-time information concerning cybersecurity threats in a process led by the White House Cybersecurity Coordinator.
- The federal government should take an active role in developing public-private cybersecurity partnerships.
- The Executive Branch should expand existing and develop additional educational programs, scholarship funding, training programs and career paths to build workforce capability in cybersecurity.
- The Executive Branch should develop a coordinated foreign cybersecurity assistance program to assist foreign countries in the development of legal and technical expertise to address cybersecurity.
- The FCC should work with Internet service providers (ISPs) to build robust cybersecurity protection and defenses into networks offered to businesses and individuals without access to cybersecurity resources. ISPs that participate in this program should receive technical assistance from the federal government in securing their networks.
- OMB should accelerate technical actions to secure federal government networks.

Improve service delivery

- OMB and the Federal CIO Council should develop a single, secure enterprise-wide authentication protocol that enables online service delivery.
- The Executive Branch should establish MyPersonalData.gov as a mechanism that allows citizens to request their personal data held by government agencies.
- Congress should consider re-examining the Privacy Act to facilitate the delivery of online government services and to account for changes in technology.
- The federal government should undertake a series of efforts to improve the delivery of government services online.
- The Executive Branch's review of the Paperwork Reduction Act should aim to enable government to solicit input to improve government services.
- The White House Office of Science and Technology Policy (OSTP) should develop a five-year strategic plan for online service delivery.
- The federal government should improve the delivery of means-tested benefits to low-income Americans.

Civic Engagement

Create an open and transparent government

- The primary legal documents of the federal government should be free and accessible to the public on digital platforms.
- Government should make its processes more transparent and conducive to participation by the American people.
- All data and information that the government treats as public should be available and easy to locate online in a machine-readable and otherwise accessible format in a timely manner. For data that are actionable or time-sensitive in nature, the Executive Branch should provide individuals a single Web interface to manage e-mail alerts and other electronic communications from the federal government.
- All responses to Freedom of Information Act (FOIA) requests by Executive Branch and independent agencies should be made available online at www.[agency].gov/foia.
- The Executive Branch should revise its Data Quality Act guidance to encourage agencies to apply the Act more consistently and facilitate the re-publishing of government data.

Build a robust digital media ecosystem

- Congress should consider increasing funding to public media for broadband-based distribution and content.
- Congress should consider amending the Copyright Act to provide for copyright exemptions to public broadcasting organizations for online broadcast and distribution of public media.
- The federal government should create and fund Video.gov to publish its digital video archival material and facilitate the creation of a federated national digital archive to house public interest digital content.
- Congress should consider amending the Copyright Act to enable public and broadcast media to more easily contribute their archival content to the digital national archive and grant reasonable non-commercial downstream usage rights for this content to the American people.

Expand civic engagement through social media

- The Federal Chief Information Officers (CIO) Council should accelerate the adoption of social media technologies that government can use to interact with the American people.

Increase innovation within government

- The White House Office of Science and Technology Policy (OSTP) should create an Open Platforms Initiative that uses digital platforms to engage and draw on the expertise of citizens and the private sector.
- The Executive Branch and independent agencies should expand opportunities for Americans with expertise in technological innovation to serve in the federal government.

Modernize democratic processes

- Federal, state and local stakeholders should work together to modernize the elections process by addressing issues such as electronic voter registration, voting records portability, common standards to facilitate data exchanges across state borders and automatic updates of voter files with the most current address information.
- The Department of Defense (DoD) should develop a secure Internet-based pilot project that enables members of the military serving overseas to vote online.

Public Safety

Promote public safety wireless broadband communications

-Create a nationwide interoperable public safety wireless broadband communications network (public safety broadband network).
- Survey public safety broadband wireless infrastructure and devices.
- Ensure that broadband satellite service is a part of any emergency preparedness program.
- Preserve broadband communications during emergencies.

Promote cybersecurity and the protection of critical broadband infrastructure

- The Federal Communications Commission (FCC) should issue a cybersecurity roadmap.
- The FCC should expand its outage reporting requirements to broadband service providers.

- The FCC should create a voluntary cybersecurity certification regime.
- The FCC and the Department of Homeland Security (DHS) should create a cybersecurity information reporting system.
- The FCC should expand its international participation and outreach.
- The FCC should explore network resilience and preparedness.
- The FCC and the National Communications System (NCS) should create priority network access and routing for broadband communications.
- The FCC should explore broadband communications' reliability and resiliency.

Encourage innovation in the development and deployment of Next Generation 911 (NG 911) networks and emergency alert systems

- The National Highway Traffic Safety Administration (NHTSA) should prepare a report to identify the costs of deplying a nationwide NG 911 system and recommend that Congress consider providing public funding.
- Congress should consider enacting of a federal regulatory framework.
- The FCC should address IP-based communications devices, applications and services.
- The FCC should launch comprehensive next-generation alert system inquiry.
- The Executive Branch should clarify agency roles on the implementation and maintenance of a next-generation alert and warning system.

Implementation And Benchmarks

- The Executive Branch should create a Broadband Strategy Council to coordinate the implementation of National Broadband Plan recommendations.
- The FCC should quickly publish a timetable of proceedings to implement plan recommendations within its authority, publish an evaluation of plan progress and effectiveness as part of the annual Section 706 Advanced Services Inquiry, create a Broadband Data
- Depository and continue to utilize Broadband.gov as a public resource for broadband information.
- The FCC should publish a Broadband Performance Dashboard with metrics designed to track broadband plan goals.

Source: FCC (2010)