National Broadband Plan for the State of Qatar

Policy Instrument Proposal

DRAFT

The Supreme council for Information & Communication Technology 'ictQATAR'

8 May 2013

Table of contents

Definitions

ictQATAR	Supreme Council for Information and Communication Technology in Qatar: Qatar's ICT policy and regulatory body
Es'hailSat	Broadcasting and communications satellite set to be launched in Q3 2013 by the Qatar Satellite Company
Government Network (GN)	Direct link between Qatar's government agencies over a secure communications platform, allowing for improved data sharing, enhanced security for e-services and continuous availability
Hukoomi	Official government web portal of Qatar. It is a gateway to information about the country, connecting members of the public with government services, programs and initiatives
Lusail, Barwa City, The Pearl	New real estate developments under construction or recently constructed in the Doha region
Mainstream expatriates	Foreign workers excluding transient labour force
Mainstream population	Qatari citizens and mainstream expatriate population
National ICT Plan 2015 (NIP 2015)	Government plan for Qatar's ICT strategy until 2015, promoting the development of the country towards becoming a knowledge based economy
Public sector	Government ministries, agencies and public organisations in Qatar
Qatar Foundation	Government supported non-profit organisation striving to make Qatar a leader in education, science and research
Qatar National Vision 2030 (QNV 2030)	Vision and long term objectives for Qatar across four key development pillars (human, economic, social and environmental)
Qatar's Assistive Technology Centre (MADA)	Qatari non-profit organisation that aims to empower and enable persons with disabilities and the elderly through Assistive Technology
QNBN	Qatar National Broadband Network: passive fibre infrastructure available on an open access basis
SME	Small and Medium Enterprises include: companies between 2 and 5 years old having less than 50 employees, or less than 150 employees if in the construction and manufacturing sectors; companies more than 5 years old with less than 250 employees.
Transient labourers	Low skilled or unskilled foreign labour force residing in labour camps

EXECUTIVE SUMMARY

The Government of Qatar, through the Supreme Council for Information and Communication Technology (ictQATAR), recognises the importance of broadband connectivity in achieving the 2030 National Vision for human, social, economic and environmental development. This document, Qatar's first National Broadband Plan, provides the guidelines and actions that the nation needs to follow in the next decade to ensure that the opportunities offered by broadband technology are realised and maximised.

Qatar's leadership has set visionary objectives for the economic diversification of the country. As the nation moves away from its reliance on hydro-carbons, a knowledge society is set to emerge, competing at a global level across all fields of learning. Broadband connectivity is central to unleashing this potential, enabling every entity in the country, whether individuals, public institutions or private corporations, to access vital information and services and innovate in the broadband economy.

The National Broadband Plan's overarching objective is to support and promote broadband market development. This entails providing high-quality, affordable and high-speed broadband services to all, in order to support the creation of a knowledge-based economy, promoting economic diversification and enhancing innovation.

The National Broadband Plan fulfils the dual purpose of reflecting the Government's commitment to broadband, and to provide guidance to the market. It describes a set of four action areas, each containing short-term and long-term cross-sector policy actions, the implementation of which will be crucial to achieving the Plan's overarching objective. To track the fulfilment of these initiatives and to provide a catalyst for their achievement, the following set of targets is proposed:

1. **All population will have access to at least two providers of broadband by 2016, irrespective of location**
2. **95% of households will have affordable and high-quality access to at least 100Mbit/s effective download and 50Mbit/s effective upload speeds by 2016**
3. **75% of households will have active broadband subscriptions of at least 8Mbit/s effective download and 4Mbit/s effective upload speeds by 2016 (which represents the definition of basic broadband in this plan)**
4. **All businesses, schools, hospitals and government institutions will have affordable and high-quality access to at least 1Gbit/s effective symmetrical speeds by 2016**
5. **All mainstream population to be digitally literate by 2022**

The road ahead has a number of obstacles and challenges. By providing the required guidance, the National Broadband Plan is intended to remove a number of these obstacles to broadband development in Qatar. Disruptive technologies and market evolution will be continuously affecting the broadband landscape. Ultimately, however, it is the contribution of public and private institutions as well as individuals that will drive the success of this plan.

CHAPTER 1 – TOWARDS THE 2030 NATIONAL VISION: WHY BROADBAND MATTERS

The future is notoriously difficult to predict. However, it is clear that broadband has the potential to play a central role in the daily life of everyone, vastly improving their well-being. Recognising this is the first step in a journey that will make Qatar a leading broadband economy in the region.

Growth in demand for broadband access is expected to be driven by the continuous evolution of communication and storage technologies, increasing sophistication of devices, and the ever-increasing role of the internet and the applications it powers. Ever-increasing amounts of visual and audio data are being created, stored and accessed, and the networks that give access to this content are becoming ever more extensive.

As awareness of the possibilities offered by broadband grows among consumers, so too will their expectations. Video, which makes up a significant volume of Internet traffic, will continue increasing in quality, with next-generation high-definition standards requiring even more bandwidth. As the devices which produce such content become more affordable and popular, this will increase the amount of data produced, with users taking advantage of share-enabling technology, whether on social networking sites or through cloud applications. Similarly, the proliferation of devices used to access such content (including laptops, tablets, cellular phones and nascent next-generation devices such as head-mounted displays), advances in mobile and wireless network technology enabling ubiquitous access to broadband and the development of increasingly sophisticated applications leveraging the cloud will further drive growth in broadband traffic.

But data producing devices will not be limited to individual use. The internet of things, built on the back of smart-sensor proliferation, will drive the expansion in the number of connected devices. Machine-to-machine communication (the transmission of data collected by sensors or metering devices) is set to play a key role at all levels of the broadband ecosystem, ranging from individuals to local communities and entire cities, with applications such as smart meters being used for remote, real-time energy monitoring and control. The wealth of data collected will also be driven by “Big Data”, referring to the collection and analysis of customer activities online and offline, increasing bandwidth demand, but also creating dilemmas on issues of privacy.

CLOUD SERVICES

Breaking the traditional approach where IT infrastructure and applications are owned, cloud services offer business and residential users the opportunity to access computing power, storage capacity and application services over the internet, on an on-demand self-service basis. By providing users with elasticity and charging them only for what they use, business models are changing, enabling companies to become more rapidly operational without incurring the cost of deploying their own IT infrastructure. Ubiquitous and reliable broadband is essential to benefit from cloud services, with required download and upload speeds adapted to the user’s needs.

Broadband-enabled applications will also give residents the opportunity to increase their civic engagement and benefit from increased economic opportunities. Improved availability and access to information and public services will empower the individual, allowing him to play a more active role in society through e-government services. The availability of high-speed broadband opening access to online job adverts or educational material will not be a privilege of the connected few, but the right of all. High-speed, affordable and ubiquitous broadband will remove the barrier to the take-up of cloud services, benefiting businesses of

all sizes, while it will also support the development of e-health services, reducing the need for transportation and providing more relevant and more efficient medical care. Home monitoring of patients using video-links will reduce the load on hospitals, while enabling quick intervention in case of necessity and remote diagnostics. Education also stands to be positively affected, with access to global knowledge being made more ubiquitous and enabling more people to follow their academic interests and professional careers. The ability to access distance learning will remove geographical limitations, while also enabling more population segments to benefit, such as people with limited mobility.

These are just a fraction of the numerous possibilities offered by access to high-speed ubiquitous broadband. The next decade will undoubtedly see new broadband-enabled opportunities emerge, and broadband occupy an ever growing role in our daily lives.

1.1 Background to the National Broadband Plan

Qatar is undergoing unprecedented economic development. According to Economy Minister Yousuf Hussein Kamal, the country is ready to invest USD 200 billion in infrastructure projects in the next decade[1], including the ones for hosting of the FIFA World Cup in 2022. The World Cup provides a unique opportunity for Qatar to enhance its global standing by demonstrating how its investment in technology can enable a host of new digital services for both visitors and international viewers alike.

Qatar's broadband market sits today at a crossroad. On the one hand, broadband penetration is high by global levels, while state-of-the-art fixed and mobile technology is being deployed. On the other hand, competition is limited, as is the range of broadband services on offer to both consumers and businesses, while significant gaps remain in ICT literacy levels. Clarity and direction are needed to provide certainty to corporations and large real-estate developers in the process of deploying their telecoms networks. Qatar's residents also need to be ensured that they can safely use broadband services, implying not only having the required capabilities and skills, but as importantly feeling confident that their online activities will not affect their privacy and security. Maintaining the status-quo is not an option. A plan is now required to provide the necessary actions to maximise the use of broadband and establish a knowledge-based economy within Qatar.

As the country strives to reduce its dependency on natural resources, a digital economy, enabled by broadband, will have to play an increasingly prominent role in achieving economic growth and diversification. The expected population growth will be accompanied by increasing pressures on the local environment, making it even more important to address Qatar's carbon footprint, an objective to which broadband can contribute. Care will also need to be taken with regards to managing the impact of broadband on Qatar's heritage, traditions and values. The plan balances the imperatives of Qatar's economic, social and environmental sustainability, with the local market context.

1.2 The National Broadband Plan in the context of existing initiatives

Qatar's General Secretariat for Development Planning published the Qatar National Vision 2030 (*QNV 2030*) in 2008,[2] in which it defined the long-term objectives of the country across four pillars of development:

[1] http://thepeninsulaqatar.com/qatar-business/232328-qatar-to-invest-200bn-in-major-projects.html
[2] http://www.gsdp.gov.qa/portal/page/portal/gsdp_en/qatar_national_vision/qnv_2030_document/QNV2030_English_v2.pdf

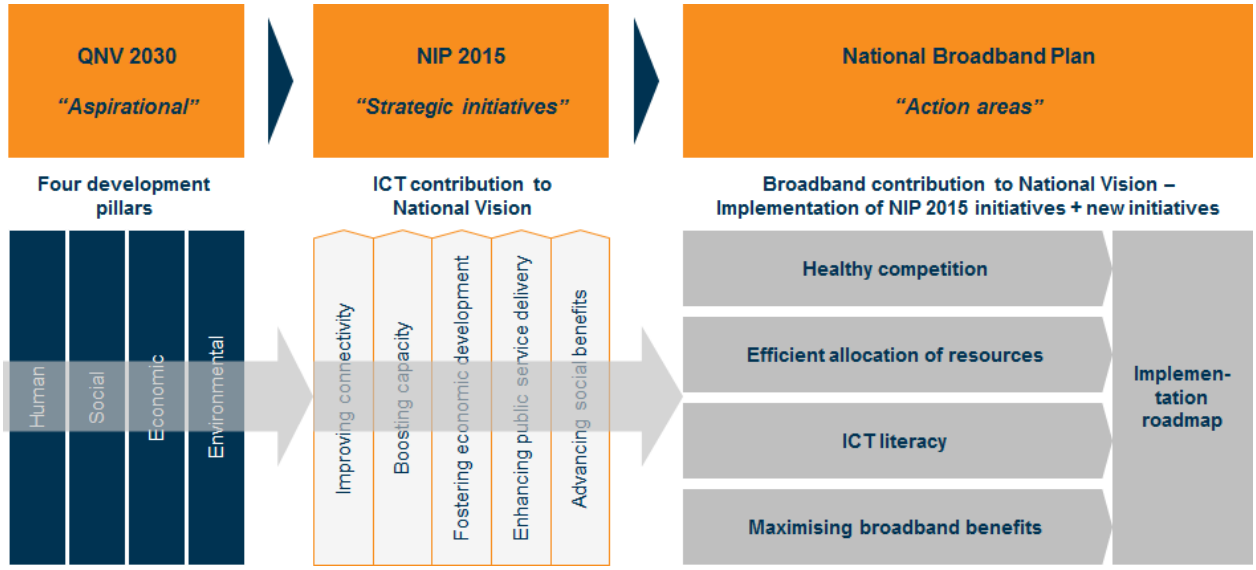
human, social, economic and environmental. *QNV 2030* envisages a prosperous society for all inhabitants, built on a diversified and competitive economy, and relying on high moral standards and respect for the environment.

A first step has already been taken in that direction, in the form of the National ICT Plan 2015 (*NIP 2015*)[3]. Recognising the crucial contribution of information and communications technology (ICT) in achieving the long-term objectives described in *QNV 2030*, *NIP 2015* defined a first set of goals for 2015, notably:

- doubling ICT's contribution to Qatar's GDP
- achieving ubiquitous high-speed broadband access for 95% of households and businesses
- achieving ICT and Internet adoption by 90% of the population and across all segments.

The National Broadband Plan is aligned with the *QNV 2030* and the objectives of *NIP 2015*, and ensures that Qatar maximises the opportunities arising from the FIFA World Cup in 2022. It demonstrates Qatar's commitment to becoming a leading digital economy. Due to technological advances in fixed and mobile broadband technology, as well as the rapid pace of development of Qatar, the National Broadband Plan will need to be reviewed and maintained regularly to adapt to these changes. The next review will happen in 2016, matching the target date for the achievement of the short-term targets.

Figure 1: The National Broadband Plan in the context of existing initiatives



1.3 Objective and structure of the National Broadband Plan

The National Broadband Plan is a roadmap towards the realisation of a number of broadband development initiatives. It extends *NIP 2015* not only through its longer time horizon (set for the 2022 FIFA World Cup), but more importantly by following a diagnostic-based approach to identifying the current barriers that are

[3] http://www.ictQATAR.qa/sites/default/files/documents/Qatar%27s_National_ICT_Plan_English.pdf

preventing Qatar from achieving its ambitions. These barriers lead to the identification of four action areas, each containing specific initiatives which will contribute to lifting these barriers:

- **Supporting healthy competition –** Policy actions required to foster real competition in the market. This set of actions will support the effort towards achieving the first broadband target (all population to have access to at least two providers of broadband by 2016, irrespective of location).

- **Ensuring efficient management of resources –** Policy actions required to ensure that fixed and mobile infrastructure is deployed in the most efficient and rapid manner, while spectrum and international capacity are optimally managed and do not constitute a constraint to broadband adoption. This set of actions will support the effort towards achieving the second and fourth broadband targets (95% of households to have affordable and high-quality access to at least 100Mbit/s effective download and 50Mbit/s effective upload speeds by 2016; and all businesses, schools, hospitals and government institutions to have affordable and high-quality access to at least 1Gbit/s effective symmetrical speeds by 2016).

- **Ensuring broadband take-up –** Policy actions that address digital literacy, affordability, quality of service, awareness and safety barriers, and that ultimately ensure the universal take-up of broadband in Qatar. This set of actions will support the effort towards achieving the third and fifth broadband targets (75% of households to have active broadband subscriptions of at least 8Mbit/s effective download and 4Mbit/s effective upload speeds by 2016; and all mainstream population to be digitally literate by 2022).

- **Maximising broadband benefits –** Policy actions addressing the need for an extensive and high-quality supply of broadband content and services that will drive adoption. This set of actions will support the effort towards achieving the third broadband target (75% of households to have active broadband subscriptions of at least 8Mbit/s effective download and 4Mbit/s effective upload speeds by 2016).

Chapter 2 presents the short-term and long-term targets for Qatar, providing the rationale for their selection. Chapter 3 examines the state of the broadband market in Qatar, and lists the identified barriers to broadband development. Chapters 4 to 7 constitute the core part of the National Broadband Plan, and correspond to each of the four action areas for which policy actions are defined. Responsibility has been assigned to the relevant stakeholders for each of the policy actions. Chapter 8 provides practical recommendations to undertake the actions included in this plan, and includes a RACI matrix for each of the identified initiatives. By definition, the RACI matrix contains additional details on stakeholders' roles, and should be examined accordingly by all stakeholders.

CHAPTER 2 – SETTING BROADBAND TARGETS

The primary objective of the National Broadband Plan is to focus on the development of a rounded set of policy measures to support broadband market development. For the purpose of this plan, basic broadband is defined as a service offering 8Mbit/s effective download and 4Mbit/s effective upload speeds, to ensure a comfortable experience for the basic services of browsing, video communication and entertainment, but to also stimulate the adoption of higher-speed broadband services. By addressing both supply- and demand-side considerations, the Plan includes specific objectives to stimulate adoption for all key contributors in the broadband ecosystem.

While speed, coverage and take-up are essential metrics to determine the success of broadband within a country, they cannot be expected to drive the success of the entire broadband ecosystem alone. Taken in isolation, they represent an uncertain metric in the context of a rapidly evolving technology and set of services, but they also do not address the development needs for a multitude of vital broadband components linked to stimulating demand, which also need to have their targets set.

Nonetheless, setting specific targets is essential for stakeholders to quantify their objectives, point to the right direction, and track the fulfilment of the policy actions. As such, the National Broadband Plan sets forward the following five targets.

Target 1:	**All population to have access to at least two providers of broadband by 2016, irrespective of location** Robust competition is a key driver of consumer welfare and innovation. It lowers prices, improves quality of service and promotes the development of new services, ultimately providing more choice to consumers and businesses alike. Competition in the provision of broadband services in Qatar is limited, with consumers and especially business having access to only one service provider. Promoting the development of effective competition in the broadband market is a key priority for the government. This target therefore aims to overcome the key barrier restricting broadband service deployment and take-up in Qatar. The 2016 target corresponds to the expected end of the national broadband network deployment which will form the basis for true broadband competition in the country.
Target 2:	**95% of households to have affordable and high-quality access to at least 100Mbit/s effective download and 50Mbit/s effective upload speeds by 2016** End-user demand patterns and the need for sufficient service quality define bandwidth requirements. In the period to 2016, the types of applications that will be in use are relatively predictable, and as such so is the bandwidth that will be required. A target of 100Mbit/s availability will ensure households have comfortable access to any of the expected applications in use, including access to the most bandwidth-hungry ultra-high-definition media and home-office/virtual private network (VPN) applications. To ensure the success of teleworking and home-based employment, high upload speeds are called for. The 2016 objective is directly linked to the market investments being made in the form of the national broadband network and the pace of its deployment.

Target 3:	**At least 75% of households to have active broadband subscriptions of at least 8Mbit/s effective download and 4Mbit/s effective upload speeds by 2016 (i.e. basic broadband)** Access to high-speed broadband does not ensure take-up. To ensure the growth of the Qatari economy through active participation in the broadband ecosystem, the Plan calls for a minimum number of households to subscribe to broadband services, with a download speed that enables the comfortable use of a minimum range of applications for basic Internet usage. The implication of such a target is that affordability of 8Mbit/s broadband will need to be ensured, as will the need to raise awareness of the benefits brought by broadband.
Target 4:	**All businesses, schools, hospitals and government institutions to have affordable and high-quality access to at least 1Gbit/s download and upload speeds by 2016** Business-continuity requirements are becoming more stringent globally and there is growing intolerance to business downtime. In this context, the need for regular back-up of mission-critical information to remote data-centre services becomes more acute. Enterprises and public institutions will be given the possibility to benefit from 1Gbit/s download speeds offered by service providers. Such links will also be beneficial to institutions with multiple locations that require high-availability and low-latency services, which are of particular importance in the context of e-health and e-education deployments.
Target 5:	**All mainstream population to be digitally literate by 2022** Qatar's population will ultimately be the driver of broadband demand, but also a key contributor to the economy as a whole. To ensure innovation thrives across all sectors, full digital literacy is required at all levels, from government to businesses to individuals. Such a target is ambitious, and not one that is achieved overnight. It is however an essential one, which will require significant government intervention. While all efforts will be made to extend the digital literacy of the transient population, their temporary stay in Qatar and high turnover will make it difficult to achieve this target for this segment.

The targets relating to speed metrics are characterised by equivalent or close to equivalent download and upload speeds. This translates the will of Qatar to make its residents active participants in the broadband ecosystem rather than mere consumers.

CHAPTER 3 – THE STATE OF BROADBAND IN QATAR

The last years have witnessed a significant increase in broadband adoption by Qatar's population, through both fixed and mobile technologies. A sustained effort by public institutions and private entities has provided a boost to adoption, but several issues are preventing the full power of broadband to be unleashed across all market segments. The sections below provide an overall description of the state of broadband in Qatar.

3.1 Broadband adoption in Qatar

Understanding Qatar's unique socio-demographic structure is a pre-requisite to any analysis of broadband adoption in the country. While it has a relatively small citizen population of around 250 000 people, Qatar is a nation in the middle of an economic and construction boom. This is sustained by a sizeable population of expatriate workers from other Arab nations and across Asia. These expatriate workers outnumber Qatari citizens, and therefore represent a significant factor in the socio-demographic make-up of Qatar's economically active population. However, it is a population segment that does not enter into the definition of households, as they reside primarily in dormitory compounds with multiple tenants per room. In addition to expatriate workers in the construction industry, there are also many expatriate domestic workers in Qatar, which increases the average household size, thus driving the number of households lower.

Broadband adoption in Qatar has increased steadily in the past years. As of the end of 2012, there were 193 000 fixed broadband subscribers (see Figure 2 below), representing a household penetration of 69%, ranking Qatar 23rd globally (Figure 5). However, most subscribers take up lower-speed packages (Figure 4), driven by the high cost of higher-speed broadband services and a lack of awareness of the benefits from higher throughputs.

Mobile broadband usage (using 3G technology and above) has seen strong growth: in 2012 alone, the subscriber base more than doubled to over 420 000 subscriptions (Figure 3). The proliferation of data-friendly handsets in conjunction with a drop in mobile data tariffs has fuelled this increase in demand.

Figure 2: Evolution of fixed broadband adoption in Qatar per product type [Source: ictQATAR, Ooreedoo, Vodafone]

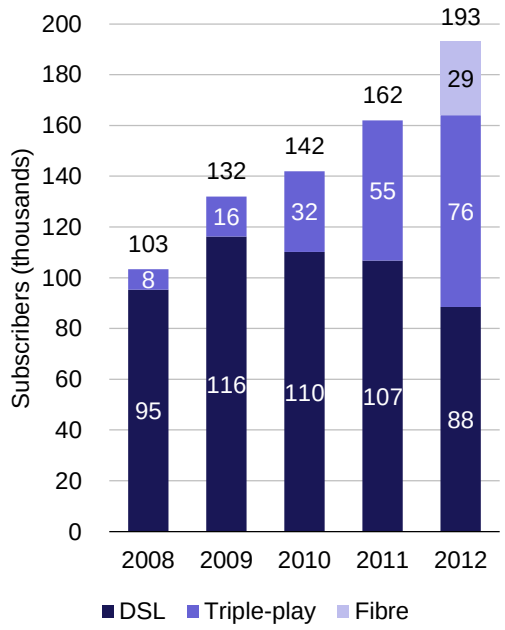


Figure 3: Evolution of mobile broadband adoption in Qatar per access medium [Source: Ooreedoo, Vodafone]

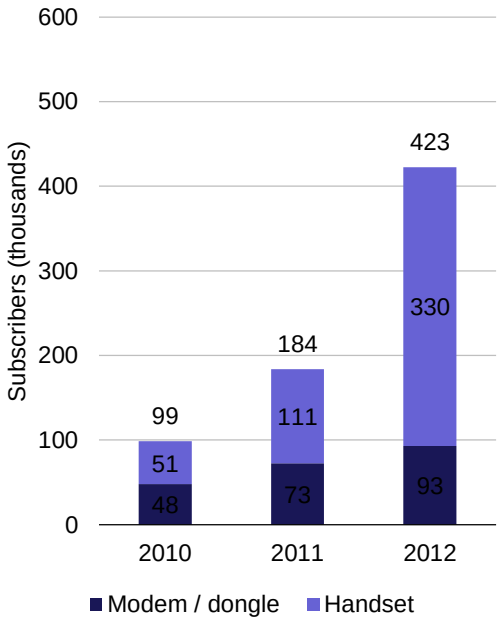


Figure 4: Internet speeds in households with internet access [Source: Qatar's ICT Landscape 2013:Households and Individuals Report]

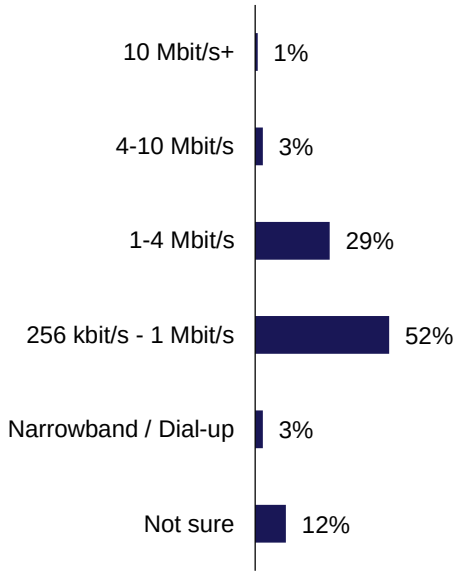
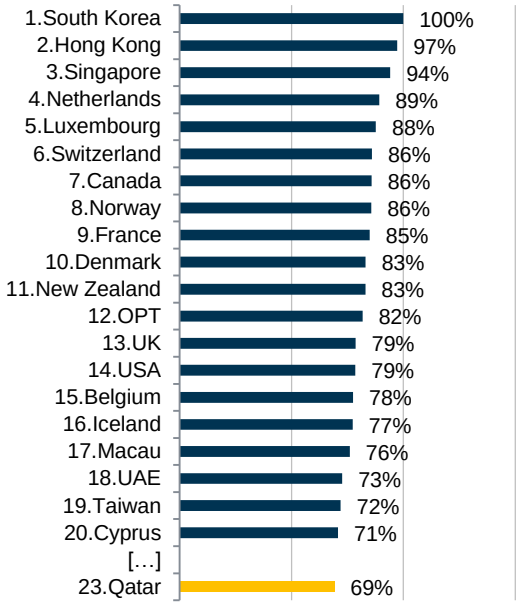


Figure 5: Global ranking of Qatar in terms of fixed broadband household penetration, end of 2012 [Sources: Euromonitor, Ooreedoo, ictQatar]



3.2 Barriers to broadband development: facts and implications

Despite its healthy broadband adoption rates, a number of barriers have been identified as impeding the establishment of a broadband ecosystem in Qatar:

- Limited fixed broadband competition
- Inefficient management of resources
- Barriers stifling demand (ICT benefits awareness, affordability, safety and trust
- Supply-side barriers including limited content and services, and an insufficiently adequate environment to support the adoption of such services

3.2.1 Limited fixed broadband competition

Despite the advances in mobile broadband technology, fixed services remain a necessity for the broadband experience of corporate and residential users alike. Fixed line infrastructure - especially fibre - can provide far better performance than is possible over mobile broadband alternatives.

Despite the presence of the two licensed retail operators Ooreedoo and Vodafone, real competition in the fixed domain has yet to establish itself in the market. The majority of fixed broadband subscribers are served by incumbent Ooreedoo, with Vodafone's presence being limited to select real-estate developments of The Pearl Qatar, and Barwa City. Vodafone's fixed infrastructure deployment is dependent on Qatar's National Broadband Network (QNBN), a government-led initiative to deploy a fixed passive fibre network with an expected reach of 95% of households and 100% of businesses by 2015. For this reason, QNBN's deployment is crucial to establishing competition in fixed services.

To ensure service-based competition, the current licensing regime and regulatory framework for wholesale access will be enhanced. Empowering the regulatory authority will further promote competition, by ensuring the timely granting of rights-of-way for vital infrastructure sharing agreements, which in turn will enable faster network deployments.

Improving competition will positively affect the price and quality of the broadband service offering, for both residential and corporate segments. This is intended to lead to higher take-up rates, and potentially encourage corporations willing to establish themselves in the region to select Qatar. Additionally, this will remove some of the barriers to innovation and operation faced by start-ups and SMEs, including connectivity affordability and the absence of adapted services increase barriers to innovation. The lack of affordability has been a contributory factor in the development of a 'digital divide': lower earning segments are prevented from gaining access to high-speed Internet and participating in the broadband ecosystem.

3.2.2 Inefficient management of resources

The resources to ensure ubiquitous broadband across Qatar's population are many. They include the infrastructure itself (e.g. physical fibre network and ancillaries), spectrum for mobile broadband, international bandwidth capacity, or the financial, labour and material resources to make this a reality.

They also include an effective service offering, which is essential to maximise the benefits of broadband connectivity. A number of bottlenecks to efficiency have been identified, the resolution of which should support rapid market development.

Both Ooreedoo and QNBN are deploying fibre networks, and it is expected that by 2016, more than 95% of households qnd 100% of business will be covered. This situation will be reviewed to:

- Ensure the viability of the QNBN, which was set up to serve as a passive wholesale provider of fixed telecoms services to Qatar's current and future licensed operators.
- Provide certainty to the corporate market as to the process to follow for their broadband needs. This is particularly true for real-estate developers, who have to adhere to tight schedules and ensure that fibre networks are deployed relatively early in the deployment of their units.
- Limit the duplication of financial capital and labour resources.

With increasing broadband access through mobile devices and constant technological evolution, the need for efficient use of spectrum (building on the latest international developments) is becoming all the more pronounced. A spectrum release and allocation plan is therefore required to ensure that Qatar positions itself at the forefront of mobile technology use.

Allocation of international capacity is an equally important element to efficiently address the growing international bandwidth need. The market for international capacity is only open to Qatar's licensed telecoms operators, who control the amount of bandwidth made available within the country. Organisations with significant connectivity needs are therefore dependent on these operators. Some of Qatar's neighbouring states, by contrast, have an open-access policy in place.

Finally, resources also include the physical infrastructure required to deploy fixed and mobile networks. To date it has proved difficult to gain access to existing ducts and poles for fibre deployment, rooftops or private land for the establishment of mobile base stations, or buildings for vital interconnection requirements and colocation space. This has the effect of delaying network deployments in the country, and even leading to sub-optimal network designs.

3.2.3 Demand-side barriers: awareness, affordability and safety concerns

Despite the efforts made by Qatar's public institutions to promote broadband take-up, a number of demand-side barriers remain. These present a direct risk to economic diversification and foreign investment in Qatar.

- The Qatari population suffers from low ICT literacy across certain sub-groups (women, senior citizens, and to a lesser extent youth)
- The affordability of fixed broadband services remains a particular concern, slowing the adoption of higher-speed broadband packages for both consumers and businesses.
- Lack of awareness of the benefits of having a media presence, and lack of trust in the underlying infrastructure that enables cloud services, especially in the SME segment. Added to concerns over affordability, this is affecting companies' performance, competitiveness and growth prospects, as it

limits their efficiency and access to wider markets. It is widely expected that with proper competition in the provision of broadband services, these reservations will decrease.

- Safety concerns exacerbated by cultural and religious aspects are keeping people away from subscribing to broadband access. A lack of knowledge surrounding data privacy and the use of private data by third parties or other individuals are of particular concern, as witnessed by numerous incidents originating from social networks. Additionally, there is a recognised gap in ICT knowledge between parents and children. Where parents have minimal ICT knowledge, there will be no safeguards for children, who may be exposed to inappropriate content. In other cases, parents with some limited ICT knowledge may be against broadband as a matter of principle (as they see the risks to more vulnerable family members), when in fact, they may overestimate the dangers due to a lack of awareness of tools such as parent control mechanisms. The two broadband providers do not have a consistent approach to treatment of inappropriate content, which is not helping quell these safety concerns.

3.2.4 Supply-side barriers: content, services and an enabling environment

While supply-side barriers are partly driven by the demand-side barriers identified above, the range of services, and the environment supporting the adoption of such services, remains limited. These barriers include:

- A shortage of robust and reliable corporate broadband services: while the inadequacy of corporate services on offer can be largely attributed to the lack of competition, the limited portfolio and quality of managed solutions affects the appeal of Qatar as a destination for setting up business. Additionally, a lack of adequate cyber-security services poses economic and social risks to the country, with threat mitigation or threat prevention services remaining expensive, especially for smaller enterprise. In the context of the increasing sophistication of cyber-attacks, customer side technology may be insufficient, due to either poor configuration or technically inferior services.
- Current initiatives to support local and Arabic language content lack scale, limiting the opportunities for Qataris who want and would use more local language services
- A still limited range of broadband-enabled public services:
    - Qatar's e-government 'Hukoomi' services have witnessed a broad increase in adoption, but are still not in use by the majority of the population. While this lack of usage does not presently impact broadband take-up (currently, such services do not require a particularly large amount of bandwidth), it is likely to lessen the demand for more complex and demanding future transactional services.
    - e-health and e-education initiatives are still in the planning phase.
    - Environmentally oriented applications supported by broadband infrastructure are being piloted, and have the opportunity to significantly reduce the increasing environmental pressure on Doha and Qatar as a whole.
- A significant uncertainty surrounding the legal environment on issues of copyright, privacy and media. Current legislation does not ensure protection of digital content. This creates a barrier to media-producing companies establishing themselves in Qatar, with a corresponding impact on digital content creation and hosting in the country. The lack of a clear media regulation exacerbates this obstacle, as it is not presently clear to what extent the proposed new media law will lead to an increase in open

information sharing – in the event it does not, production of content will be affected due to self-censorship. Finally, a clear policy on the handling of private data by third parties is lacking, giving further weight to the concerns of certain segments of society regarding take-up of broadband services.

- Social and cultural norms are preventing the emergence of an entrepreneurial segment, especially among the Qatari population, who prefer the security offered by traditional jobs. While some public initiatives seek to address this through its support for digital entrepreneurs, their limited size cannot make them the sole facilitator of start-up development in the country.
- Qatar has been and is continuing to implement a number of cyber-security policies, such as the Government Information Assurance Policy (providing the necessary foundation and relevant tools to government institutions in order for them to implement adequate information security management systems) which fits within the National Information Assurance framework; the National ICS security standard (providing the minimum controls that need to be incorporated or addressed for any industrial control system that is critical to Qatar); or the Banking Supervision Rules issued by the Central Bank of Qatar, which is a handbook of cyber-security rules to be followed by banks. What is now required however is a comprehensive cyber-security strategy, to ensure common measures are applied to Qatar's corporations in terms of cyber-defence. As each company currently follows independent policies, Qatar is as safe as the weakest interconnected link on its territory. Sufficient security to Qatar's vital infrastructure can also be improved, by redundantly physically connecting all critical government agencies, to avoid the existence of single points of failure that could have damaging consequences to government continuity in the event of a natural disaster, an outage or a physical or cyber-attack.

CHAPTER 4 – ACTION AREA 1: SUPPORTING HEALTHY COMPETITION

Competition is a vital driver of consumer welfare: it lowers consumer prices, improves the quality of service, contributes to the emergence of new and innovative services, and increases take-up, while providing higher levels of customer satisfaction. To improve competition in Qatar, the underlying issue of regulation will be addressed.

Policy objectives:

- An effective competitive environment for the provision of broadband services in Qatar, ensuring a real choice for consumers and businesses, for both mobile and fixed networks, irrespective of geography.
- A regulatory framework which enables sustainable competition, and a regulator that is empowered with the ability to enforce its decisions.

Broadly, competition in the fixed broadband market can be encouraged in one of two forms:

- **Infrastructure-based competition**, where multiple service providers each have their own multiple physical access networks and compete at that level
- **Service-based competition**, where there is one infrastructure, with competition occurring at the service level (price, products, services)

In Qatar, Ooreedoo and QNBN are investing in fixed fibre-based infrastructure, while Vodafone is relying on QNBN's passive infrastructure to offer its services. With a fibre infrastructure expected to reach 95% of households and 100% of businesses by 2016, it is unlikely that another fixed operator would be willing to deploy its own infrastructure in order to compete. As such, the focus in Qatar is to stimulate fixed network competition at the service level, by allowing third-party providers access to networks on a non-discriminatory and transparent basis.

In practice, broadband competition at the service level in Qatar will primarily be provided by Internet service providers (ISPs) gaining access to the local network infrastructure. Leveraging the passive infrastructure is not realistic for all ISPs, as the expensive active equipment requirements to light the fibre constitute a significant entry barrier. As such, ISPs will be given access to the active infrastructure or service layers.

As described in Chapter 3, the regulatory challenge in ensuring competition lies in:

- Ensuring QNBN gains rights of way to the necessary infrastructure, facilitating its roll-out. Addressing this will provide the necessary confidence to real-estate developers in dealing with QNBN for their telecoms requirements, and thus ultimately support service-based competition.
- Ensuring Ooreedoo issues a wholesale reference offer, lowering barriers to ISPs seeking to enter the broadband market.

Establishing true competition for broadband provisioning will greatly facilitate the emergence of competition for other retail services relying on broadband and offered by third parties, such as cloud

computing, disaster recovery, or a range of other data-centre services, some of which are already offered in the market by either the incumbent or independent operators. These third-party services will also be supported via an adapted telecom licensing framework to enable adoption of these services.

Required policy actions

The tables below list the policy actions that will be implemented to promote competition in the provision of broadband services

POLICY ACTION 1.1		
Develop a suite of appropriate regulatory interventions to enable legal and regulatory enforcement: the Regulatory Authority is to be given power to apply sanctioning tools and / or fines, to ensure enforcement of regulatory decisions, without having to resort to public prosecution		
Rationale	**Stakeholder responsibility**	**Policy target**
• Accelerate competition by ensuring faster compliance with regulatory decisions	• ictQATAR – Regulatory Authority	• 2014

POLICY ACTION 1.2		
Assess future market entry in fixed services (once the outcome of any consolidation of Ooreedoo's and QNBN's networks is known) with a key decision being whether future licences require new infrastructure deployment, or whether competition will be supported through a new wholesale access regulatory regime		
Rationale	**Stakeholder responsibility**	**Policy target**
• Create a level-playing field for operators	• ictQATAR – Regulatory Authority	• 2014

POLICY ACTION 1.3		
Undertake a market impact study for issuing a third licence (fixed and mobile)		
Rationale	**Stakeholder responsibility**	**Policy target**
• Support decision making and timing	• ictQATAR – Regulatory Authority	• 2014 market impact study • 2015 for issuing the licence (if deemed appropriate)

POLICY ACTION 1.4		
Act to ensure adequate quality of service a) Redefine a set of quality of service (QoS) metrics to measure performance of fibre-based services. b) Publish retail QoS**Error! Bookmark not defined.** metrics (fixed and mobile)		
Rationale	**Stakeholder responsibility**	**Policy target**
• Creates incentives for operators • Provides transparency for users	a) ictQATAR – Regulatory Authority b) ictQATAR – Consumer Affairs Department	• 2014

POLICY ACTION 1.5		
Clarify (and develop where necessary) under what conditions telecoms licences should be required for other services (e.g. data centre services) and what benefits this could bring to service provisioning		
Rationale	**Stakeholder responsibility**	**Policy target**
• Help determine if retail competition could be enhanced with a simpler authorisation procedure	• ictQATAR – Regulatory Authority	• 2014

CHAPTER 5 – ACTION AREA 2: EFFICIENT MANAGEMENT OF RESOURCES

The resources used in telecoms networks include tangible assets (such as network elements: ducts, central offices, copper lines and dark fibre etc.), and intangible assets (such as spectrum and international bandwidth capacity). Access to these assets is vital for telecoms service providers, whether these are controlled or owned by private or public institutions. Efficiently managing the rights of way of service providers to these assets is a priority for Qatar.

Policy objectives:

- Ensure ready access to ducts and sites, especially for eventual fibre upgrades and cell site constructions
- Encourage acceleration of migration to fibre, targeting a rapid switch-off of the copper network
- Develop a spectrum release and allocation plan to maximise the efficient use of the electro-magnetic spectrum and provide transparency to the market
- Ensure that the mechanisms to rapidly offer improved network capacity and coverage are in place to address the needs and expectations of residents and visitors
- Ensure sufficient international bandwidth is made available to Qatar's private and public institutions

Fibre networks, which are capable of providing near-limitless capacity, offer the most future-proof approach to meeting broadband demand over the long term, not only for fixed services, but also for mobile due to the expected significant backhaul requirements.

Advances in the capabilities of the passive fibre optic, and more importantly in the active electronics, have ensured that additional capacity can be added at relatively low incremental cost. This trend is set to continue, as the limitations to fibre capacity (driven by modulation techniques, architectural choices and performance constraints of networking equipment) continue to be overcome through new innovations in active equipment. In the very long term, upgraded fibre may still be required.

In either case, fibre networks have to be well planned, most notably by ensuring ready access to existing passive network elements for their deployment, such as ducts or central offices acting as points of interconnection. This will entail solving the duct ownership disputes between Ooreedoo and municipalities. Ultimately, the efficient management of resources will support the faster establishment of competition, and thus enable Qatar to open up future possibilities of innovation in application design and development that could support a strong virtuous cycle in driving both demand for, and supply of, additional bandwidth over the longer term. Ensuring efficient rights of way management will remove the limitations faced by QNBN in deploying its infrastructure, and as such address the uncertainty of real estate developers when having to decide on their partner for telecommunication infrastructure deployment.

In 2022, it will be essential to provide fixed fibre connectivity to the 12 planned stadia that will host the FIFA World Cup matches, which will be geographically distributed across Qatar. Connectivity requirements will be driven by the needs of:

- the global media, requiring high-capacity circuits, high reliability and redundancy, and low latency
- spectators, who will be mostly mobile, but will require highly available, reliable fixed backhaul to support mobile services as they record the events and interact with friends and family back home

With the transition to fibre networks, and particularly towards fibre to the premises (FTTP), the need for copper will diminish. Copper networks were originally designed for the provision of switched voice services, and it is inefficient for operators to run fibre and copper networks in parallel. The eventual switch-off and de-commissioning of copper networks will be needed to ensure operator efficiency (with the exception of vital back-up lines that will remain in service).

The usage of mobile services is anticipated to increase significantly as the capability of networks and devices improves, prices fall and new innovative services become available. However, although technological progress in wireless and cellular technology is set to continue, including through expected improvements in spectral efficiency, the GSMA predicts that many GCC states, including Qatar, could face spectrum shortfalls in urban areas by 2020[4] if they do not heavily invest in deploying additional network infrastructure. Irrespective of the technologies that emerge, Qatar will carefully manage the underlying spectrum resources enabling future mobile services for the benefit of end-users. The completion of the digital switch over plan in 2012 is a significant step towards maximising the potential for the delivery of true broadband speeds through mobile technology, unlocking the mobile broadband future – and with it, significant economic welfare. Regional co-ordination will be critical to ensure harmonization, with unilateral actions by national regulators likely to be counter-productive.

High-quality mobile networks will be particularly crucial for the 2022 World Cup, when hundreds of thousands of visitors converge on Qatar, in particular in stadium areas with high mobile traffic densities. It will be essential to track wireless technology developments to inform sound policy judgements on spectrum management.

As demand for mobile services grow, additional coverage and capacity sites will have to be deployed. This will require ensuring the smooth and timely interconnection of mobile and fixed networks, as well as simplifying the complex process and negotiations involved in cell site acquisitions (e.g. land ownership structures, price demands from land owners). As such, it is essential that a transparent and standardised process is established and more importantly enforced for interconnection and site acquisition, setting maximum delays permitted and penalty clauses, as well as setting site lease prices according to locality.

International capacity constraints will also be addressed, by considering the implications of a change in the regulatory framework towards open access, as well as launching an Internet exchange point (IXP). Countries without an IXP, including Qatar, are forced to route domestic Internet traffic onto long-distance international links, which can result in significantly higher costs for operators (which are passed on to consumers) and latency (which can result in poor customer experience). The presence of an IXP can also induce global content players to place caches locally in Qatar, which can increase the amount of locally distributed content.

Required policy actions

The tables below list the policy actions that will be implemented to ensure efficient resource management.

POLICY ACTION 2.1
Consolidate Ooreedoo's and QNBN's infrastructure and define a long-term roll-out plan

[44] GSMA 2013, *Arab States Mobile Observatory 2013*, Available at http://www.gsma.com/publicpolicy/wp-content/uploads/2013/02/GSMA_MO_ArabStates_FullReport_English.pdf

Rationale	Stakeholder responsibility	Policy target
• Maximise efficiency • Encourage investment from Vodafone • Set up the appropriate conditions for future market entry	• ictQATAR - Regulatory Authority • Ooreedoo • QNBN • Ministry of Municipality and Urban Planning • Public Works Authority	• Consolidation and plan in 2014

POLICY ACTION 2.2

Develop standard terms and conditions for access to passive network infrastructure:

- Resolving duct and land ownership issue through mapping application, and making it available to interested parties
- Clearly defining conditions and transaction policy for access to assets and acquisition of cell sites

Rationale	Stakeholder responsibility	Policy target
• Accelerate granting of rights of way, thus accelerating QNBN's deployment	• ictQATAR – Regulatory Authority • Ministry of Municipality and Urban Planning	• All duct ownerships mapped and T&Cs by EOY 2014

POLICY ACTION 2.3

Develop standard approach and co-ordination for connecting new real-estate developments

Rationale	Stakeholder responsibility	Policy target
• Ensure new developments are completed on time with a telecom infrastructure that will enable competition and offer advanced broadband services	• ictQATAR – Regulatory Authority • QNBN • Supreme Council for Economic Affairs and Investment • Ministry of Municipality and Urban Planning • Consortium of major real-estate developers	• 2013

POLICY ACTION 2.4

Consult with industry to define a roadmap for switch-off of the copper network

Rationale	Stakeholder responsibility	Policy target
• Provide market certainty • Reduce inefficiency	• ictQATAR – Regulatory Authority • Ooreedoo • Ministry of Municipality and Urban Planning • Public Works Authority	• 2014 consultation • 2016 urban switch-off • 2020 complete switch-off

POLICY ACTION 2.5

Develop a spectrum management and release plan, following the recommendations set out in ictQATAR's Radio Spectrum Policy of April 2011:

- develop a clear roadmap and process for the allocation of suitable spectrum (in terms of spectrum adopted by the international majority) and communicate this to the market
    - identify public-sector holdings and uses, and co-ordinate with departments (e.g. interior, defence, transport)
    - identify demand for spectrum through a consultation process
    - co-ordinate spectrum use at a regional level (for roaming, avoidance of interference in borders)
    - conduct a cost–benefit analysis of bands that would meet the expected demand
    - identify release issues
    - define strategy for release

Rationale	Stakeholder responsibility	Policy target
• Provide the market with greater visibility and maximise the economic value of spectrum	• ictQATAR – Regulatory Authority • Qatar National Spectrum Coordination Committee (QNSCC)	• 2014 Spectrum management and release plan

POLICY ACTION 2.6

Assess the need for legislation allowing submarine operators to provide capacity directly to consumers inside Qatar on an open-access basis, whereby access to the landing station and backhaul from the landing station to the third party's point of presence would be required:

- Regulatory Authority to review the functioning and state of supply of international capacity, and to apply any necessary remedies – this may include considering the liberalisation of the international gateway market

Rationale	Stakeholder responsibility	Policy target
• Address the limited international Internet bandwidth made available in Qatar	• ictQATAR – Regulatory Authority	• 2015

POLICY ACTION 2.7

Develop a study on the business case for an IXP in Qatar and ensuing implementation plan

Rationale	Stakeholder responsibility	Policy target
• Reduce international transit costs • improve customer experience • position Qatar as an important regional hub	• ictQATAR – Regulatory Authority	• 2014 go / no-go decision • 2016 IXP deployment

CHAPTER 6 – ACTION AREA 3: ENSURING BROADBAND TAKE-UP

Broadband is undeniably a social and economic enabler. It is therefore in the interest of Qatar to ensure the broadest possible access and use of broadband services, irrespective of geography or user segment. This entails tackling the identified barriers of digital literacy and affordability, but also providing a safe environment and the awareness of safety features to protect users from inappropriate content. It also entails encouraging the use of applications facilitated by broadband through the appropriate raising of its benefits.

Policy objectives:

- Ensure the necessary skills required to efficiently use broadband Internet and related applications are acquired in the mandatory educational curriculum
- Ensure government employees become knowledgeable of ICT for the purpose of contributing towards the development, use and promotion of e-government applications
- Ensure immoral digital content does not enter Qatar, neither is produced nor encouraged
- Protect children, in particular, and the population in general, from accessing and promoting immoral material
- Ensure affordable basic broadband access for all of Qatar's population irrespective of location
- Promote broadband adoption through incentives and awareness programs for both individuals and businesses

Qatar's residents need to have the skills to make the knowledge-based economy a reality. Without them, broadband participation is compromised. Equally, foreign investment in Qatar stands to suffer, as international companies are less willing to invest in a country which cannot provide a sufficiently qualified workforce. Skills are required at multiple levels: from basic skills on how to access information using broadband for all, to more evolved technical skills enabling innovation in digital content production and storing technologies, network technologies and network management, cyber-security, and distributed computing, but also a range of skills that accompany these requirements, across science, engineering, mathematics, economics and law.

As a balance to the development of ICT skills which enable the participation in the broadband ecosystem, it is essential for the Qatari population to acquire the skills to judge the value of information accessed. With the power conveyed by broadband to individuals in creating and sharing any kind of content they want, the risk for voluntary or involuntary manipulation through the dissemination of wrong information is very real. Qatar's residents alike will be taught to seek sources and alternate points of view, putting them in a position to develop their critical thinking capabilities and pass sound and informed judgements.

At the same time, users of broadband and in particular parents will be made aware of safety guarantees when using broadband, and be provided with the right tools to create this safety within their homes. Article 18 of the Permanent Constitution of the State of Qatar is the first guiding principle of society. It stipulates that Qatari society is based on the values of justice, benevolence, freedom, equality and high morals. Defining the moral values of a country hosting communities as culturally diverse as the ones present in Qatar is complex. What may be acceptable to one may be offensive to another, whether it is behaviour, the

use of vocabulary, appearance, or the nature and language of digital content. Although the growth in the expatriate population has broadened the perspectives of Qataris on other cultures and lifestyles, it is also threatening traditional Qatari values based on Arabic culture and Islam. *QNV 2030* specifies that education should contribute to a solid grounding in Qatari ethical and moral values. As such, it is only natural that the moral values referenced be based on Qatar's perspective. Ultimately, however, moral values are rooted in common humanity and form a common basis across cultures, to the extent that there is a broad consensus on what these moral values should be. Trustworthiness, justice, family, religious tolerance and honesty are all examples of fundamental values that surpass our cultural differences. Such values will be preserved as broadband adoption increases.

Being made aware of safety guarantees also means being informed of privacy policies, intellectual property and their limitations. The explosion in the use of social networks such as Facebook, has been accompanied by a dramatic increase in the production and sharing of user content, with end users not always in control of the type of information they share and use. Due to the trans-national nature of such networks, the end-user will be made aware of his/her responsibility to adopt a safe and morally acceptable behaviour online. This responsibility and the associated risks will be taught accordingly.

In addition to ensuring an adequate level of ICT literacy, the adoption of broadband services also requires appropriately priced products. Recognising that access to broadband is an essential element of social inclusion, universal access to basic broadband (8Mbit/s download and 4Mbit/s upload) will be ensured for all people living in Qatar, including permanent residents and temporary workers. Currently, affordability remains a barrier to adoption. The objective is to ensure that all residents who are not part of the 95% benefiting from access to 100Mbit/s connectivity targeted for 2016 be guaranteed basic broadband services irrespective of their location and financial capabilities. In rural areas, this will involve the use of mobile technology. For the transient labour force, this will involve the participation and contribution of camp owners to provide fixed broadband services, in order to address the very low disposable income in this segment.

Ultimately however, it is the benefits offered by the broadband-enabled services themselves that will drive adoption. While such services do exist, awareness of these services among individual users and businesses is low, with broadband and broadband-enabled services being either not used or under-utilized.

Required policy actions

The tables below list the policy actions required that will be implemented to ensure the broadest possible access to broadband.

POLICY ACTION 3.1		
ictQATAR to further enhance its capacity in actively conducting programmes related to the wide range of ICT skills development, including: • empowering and capacity-building of Qatari women in the use of ICT technologies, by recruiting and training female trainers with the necessary cultural understanding • providing guidance to Qatari youth on the efficient use of ICT		
Rationale	**Stakeholder responsibility**	**Policy target**
• Mass broadband adoption	• ictQATAR – Digital Inclusion Department • ictQATAR – Internet & Society	• On-going, with a target of

cannot be achieved without the right skills		100% digital literacy by 2022

POLICY ACTION 3.2

Develop a world-class ICT education programme, in line with the goals set in *QNV 2030*, including the teaching of both technical competencies and media literacy.

a) The IT programme is to be reviewed and updated on an annual basis, to ensure the relevance of the taught material in the light of the constant evolution of technology.
b) ICT and media literacy training to be extended and made mandatory to all public government employees

Rationale	Stakeholder responsibility	Policy target
• Create a generation of IT-ready individuals, who can easily develop and gain access to the digital economy	a) Supreme Education Council, Doha Centre for Media Freedom, Qatar Foundation b) Government Ministries	a) 2018 ICT curriculum in secondary education in place b) 2017 training programme for all government employees in place

POLICY ACTION 3.3

Promote government services among consumers and industry:

a) develop incentives for the use of e-government services among the general public
b) expand the requirements for e-government service use by corporations, making it mandatory for companies with more than 5 employees (currently 15)

Rationale	Stakeholder responsibility	Policy target
• Stimulate usage of e-government services, contributing to drive broadband adoption	a) ictQATAR - e-Government, Ooreedoo, Vodafone b) ictQATAR – e-Government, Chamber of Commerce and Industry	a) 100% of broadband subscribers to have used an e-government service at least once per year by 2018 b) 100% of companies with more than 5 employees to be required to use e-government services for their administrative needs by 2016

POLICY ACTION 3.4

Consult with industry to determine what the requirements are to achieve rural coverage using non-wireline technology. As a first step, areas unlikely to be addressed by the QNBN fibre network will be identified.

Rationale	Stakeholder responsibility	Policy target
• Affordable ubiquitous access	• ictQATAR – Digital Inclusion Department • Ooreedoo	• 2014 consultation and

	• Vodafone • Es'hailsat • QNSCC	feasibility study

POLICY ACTION 3.5		
Maximise population connected to at least basic broadband Internet at home throughout Qatar • Develop alternatives for a funding mechanism to subsidize broadband adoption in rural areas among low income population		
Rationale	**Stakeholder responsibility**	**Policy target**
• Universal access	• ictQATAR – Digital Inclusion Department • Ooreedoo • Vodafone • QNBN • Es'hailsat	• 75% of households subscribed to at least 8Mbit/s by 2016

POLICY ACTION 3.6		
Ensure transient labour force has basic access to Internet at labour camps: • explore the potential business case for 'cyber cafes' (workstations) in labour camps • determine budget for providing access, and consider devising business loans for willing entrepreneurs • lobby for labour-camp owners to financially support the initiative		
Rationale	**Stakeholder responsibility**	**Policy target**
• Contribute to satisfaction of a key segment behind Qatar's infrastructure development	• ictQATAR – Digital Inclusion Department • Ooreedoo • Vodafone	• 100% coverage with 8Mbit/s by 2016 in labour camps

POLICY ACTION 3.7		
Pursue provisioning Wi-Fi access in urban public places (with fair use policy), focusing on low-income residential areas		
Rationale	**Stakeholder responsibility**	**Policy target**
• Promote connectivity to the under-privileged segments of the population	• ictQATAR – Digital Inclusion Department	• Ensure free Wi-Fi signal is available within 500 metres of low-income homes by 2017

POLICY ACTION 3.8
Standardise the policy for limiting access to inappropriate content (safe browsing policy), and establish a task force to implement and maintain consistent policy irrespective of hardware or software filtering vendors:

• the task force is to be responsible for updating the policy on a regular basis		
Rationale	**Stakeholder responsibility**	**Policy target**
• Adopt a consistent policy to increased end-user trust	• ictQATAR – Internet & Society • ictQATAR - Digital inclusion Department • ictQATAR – QCERT • Ooreedoo, Vodafone, Es'hailsat	• 2015

POLICY ACTION 3.9		
Plan and conduct an awareness and education campaign to parents on the risks involved with unmonitored Internet use by children and the remedies to prevent it: • type of content available and ease of access to it • existing mechanisms to restrict access		
Rationale	**Stakeholder responsibility**	**Policy target**
• Prevent Qatari values from being negatively affected by broadband development and preserve children's safety	• ictQATAR – Internet & Society • ictQATAR – Digital Inclusion Department • Supreme Education Council	• 2014 plan • Ongoing campaign there-after

POLICY ACTION 3.10.		
Raise ICT awareness among residential and business users with a particular focus on SMEs a) Conduct assessment of broadband usage by SMEs and identify priority SME segments which stand to benefit most from broadband-enabled applications such as cloud services b) Produce awareness material to distribute, highlight the benefits brought by media presence, cloud services and internet marketing and communication		
Rationale	**Stakeholder responsibility**	**Policy target**
• Increase broadband take-up and improve economic benefits	a) ictQATAR – ICT Industry Development; ictQATAR – Internet & Society b) ictQATAR – ICT Industry Development; QNBN	• 2013, on-going campaign there-after

CHAPTER 7 – ACTION AREA 4: MAXIMISING BROADBAND BENEFITS

The initiatives included in the fourth action area relate to the supply-side of services and content as well as the establishment of a favourable environment to further maximise the benefits brought by broadband, including ensuring sufficient quality, protecting users from cyber-threats and inappropriate material, promoting investment and innovation, and promoting the use of broadband towards the preservation of the environment. Taken together, these form the basis for the broadband ecosystem to flourish.

Policy objectives:

- Ensure broadband connectivity services are competitive in regional terms
- Promote the development and offering of locally relevant broadband services and content that meet the needs and expectations of all (consumers, corporations and government)
- Ensure a robust cyber security policy is applied across all industries in Qatar
- Ensure aspiring entrepreneurs have the support they need to test and develop their ideas
- Expand and promote the use of smart technology in all households and businesses to reduce Qatar's carbon footprint, while leveraging the teleworking opportunities brought by broadband
- Adhere to net-neutrality principles subject to the preservation of moral values

Access to broadband-enabled applications can only be made possible through the provisioning of robust broadband connectivity. The current issues surrounding the quality, reliability and price of broadband connectivity services will be addressed with the utmost priority, in particular for the enterprise segment. Broadband services will address the present and future needs of this segment, which is vital in its contribution towards Qatar's economic diversification. Broadband connectivity services will include adapted cyber-security features, while the service providers will comply with IPv6 specifications. These services will match or surpass those available in the surrounding GCC markets.

While infrastructure is the foundation of a digital economy, the range of services and applications available ultimately create the demand for broadband access. As such, Qatar will offer a range of broadband-enabled services proven to stimulate demand. A supportive environment will be put in place to facilitate the emergence of new services and applications, benefiting residential users as much as small or larger enterprises. For one, increased functionality and scope of e-government services will be a driver of take-up, as will in the longer term the development of e-Health and e-Education applications. The private sector will also play its role in increasing

CASE STUDY: Ontario's e-health strategy

In 2008, the eHealth Ontario agency was created to lead the development of an electronic health record system for all the province's inhabitants. By 2012 two out of three residents had an electronic health record, and a growing number of medical institutions had the ability to access them. The key enablers of this success have been

1) Opening the development of electronic medical record software to multiple software developers, having to meet a set of specifications

2) Funding doctors to install electronic medical records software in their clinics and practices

3) Putting in place and securing databases of patient records

Crucially, eHealth Ontario has published a set of connectivity guidelines, detailing the requirements that medical practices had to fulfil in order to ensure the offering of e-health services.

broadband adoption, with the development of commercial applications, whether destined at enterprises, or at individual users. In particular, mobile application development will be encouraged, as well as the proliferation of e-commerce for Qatar-based enterprises.

Broadband will contribute to environment preservation efforts. Qatar is determined to fulfil its responsibility towards both its residents and the world in this respect, even though these aspects themselves are not drivers of broadband adoption. The combination of Qatar's climate, the near-doubling of its population in the last six years, and a large oil and gas industry has placed the country at the top of the global carbon footprint list on a per-capita basis. With population expected to surpass the three million mark by 2021, the environment will sustain increasing pressure in the years to come. Broadband will be leveraged to contribute to environmental sustainability, by:

- facilitating the remote management of appliances in homes and offices through sensor networks
- enabling smart water management through smart grids
- enabling environmental monitoring
- reducing emissions from transportation through an increased use of teleconference facilities
- optimising transit routes through traffic monitoring and intelligence transport systems
- enabling teleworking

Such applications will fit within the larger framework of 'smart-cities', which include sustainable urbanisation initiatives going beyond broadband (e.g. sustainable construction of new buildings, localised power generation, energy storage etc.).

Besides digital services, digital content represents a fundamental driver of broadband, whether accessed for informational, educational or entertainment purposes. There are two reasons to stimulate digital content creation in Qatar:

- Qatar needs to address the particular needs of the Qatari population: whereas content for the expatriate population is globally available, content tailored to the needs of Qataris is very limited to virtually inexistent

- Digital content creation and hosting will contribute to the development of the country's broadband ecosystem, and position Qatar as a digital content player in the region.

Qatar will therefore engage on a regional level to develop relevant content, including a possible wider role from the public broadcaster in producing and making accessible digital content online.

The proliferation of digital services and content will take into account the ever-increasing reality of convergence, as ubiquitous and multi-platform broadband access blurs the lines between telecoms, media and broadcasting. As the telecoms landscape changes globally, the convergence of networks, services and devices, with new Internet-based players, will attack traditional markets such as TV and voice, enabled by new technologies. Regulators will need the necessary tools to ensure that they can fulfil their duties in light of these changes. The proliferation of M2M communication, the increased availability and use of location information and the development of cloud storage are only some of the examples that will drive the functionality of future services. These services will also be adapted to the needs of Qatar's residents, to their culture, values and expectations.

Maximising broadband benefits will also entail ensuring the cyber-security of the country and its broadband users. Geopolitical tensions and Qatar's significant involvement in regional affairs are increasing the threat of cyber-attacks on the country. Infrastructure critical to Qatar's security and economic and social welfare includes the national industry leaders in energy, finance, telecoms and transport, as well as vital government information systems and services of public institutions. The spread of interconnected networks, facilitated by broadband, increases the vulnerability of this infrastructure, and a cyber-attack affecting this infrastructure could have far-reaching consequences. Creating a favourable environment where all can benefit from a trusted range of broadband services therefore implies that this critical infrastructure be secured across multiple layers. A dedicated communication network that is physically separate and not connected to the Internet would be the ultimate protection, but this is unlikely to be workable for many organisations as most have a reliance on the Internet for some aspects of their business. Hence, protection will be applied at higher layers in the network (i.e. not at the physical layer), by ensuring protection against a multitude of possible threats, such as distributed denial of service (DDoS) attacks, which have increased in number and sophistication and have affected the day-to-day operations of businesses in Qatar.

The role of entrepreneurship in addressing supply side considerations will be important. With the expansion of ICT skills, individuals will be provided with the opportunity to develop their creativity and innovate. These individuals, and in particularly the younger population with limited financial means, will be given a supporting environment to start and develop their own businesses.

Stimulating digital content creation and hosting requires addressing the issues of protecting intellectual property and privacy, which need to be balanced between the needs of copyright holders and the benefits of openness. Consumer education, addressed in the preceding chapter, partially addresses this, communicating to users that the respect of IP rights is in the interest of all, and in particular in the interest of creativity. While ensuring privacy is the responsibility of the individual and not the government, the latter is required to ensure that users are able to control their own information on Qatar-hosted domains. However, to truly stimulate content creation and hosting within Qatar, appropriate author and intellectual property protection laws will be put in place and enforced. This will include clearly defining what material is tolerated for publication, online as much as in print.

NET NEUTRALITY

Net neutrality calls for the absence of any discrimination or blocking of internet content, user, platform or protocol. While adhering to net neutrality principles is important for Qatar's residents, the imperatives of preserving moral values to maintain the cohesion of Qatar's society imply the need for content discrimination. Traffic-management techniques for network efficiency reasons should also be permitted provided such techniques do not disadvantage some users over others.

Required policy actions

The tables below list the policy actions that will be implemented to maximise broadband benefits.

POLICY ACTION 4.1

Identify corporate broadband services needs and gaps in service offering:

- develop a monitoring, compliance and enforcement framework for corporate services
- conduct a pricing benchmark of a basket of service prices in the GCC to understand the competitive disadvantage of Qatar versus its neighbours

Rationale	Stakeholder responsibility	Policy target
• Create a regionally competitive environment for the establishment of international companies in Qatar	• ictQATAR – Regulatory Authority • ictQatar – ICT Industry Development	• 2014

POLICY ACTION 4.2

Expand the development of Hukoomi services to address all population segments and expand their reach towards health and education:

a) Support the development of advanced services through decentralised data access:
   - define legal principles required for data protection, rights of access and accountability for decentralised data
   - launch and implement the effort to build a centralised repository of online health and education records, connected to all schools, universities and medical institutions country-wide

b) Launch a set of e-government services adapted to transient labourers:
   - research on services needed by transient labour population
   - make the relevant existing services available on feature phones (light-client or USSD based)
   - liaise with relevant public entities for the development of eventual new services

Rationale	Stakeholder responsibility	Policy target
• Improve quality of life • Launch innovative broadband-enabled services to stimulate take-up	a) ictQATAR – e-Government; Supreme Education Council; Supreme council for Health b) ictQATAR – Digital Inclusion Department; ictQATAR-e-Government	a) e-health and e-education) services by 2016, with e-health targets as they appear in Qatar's National Health Strategy 2011-2016[5] b) Basic e-government applications available on feature phones by 2015

POLICY ACTION 4.3

Support the development and adoption of e-commerce platforms:
- ensure an adequate legislative and regulatory framework (e.g. registration, e-payments)
- hire e-commerce and e-payment expert developers
- subsidise the development of e-commerce solutions for smaller businesses.

Rationale	Stakeholder responsibility	Policy target
• Improve Qatari business	• ictQATAR – ICT Industry Development	• 25% of SMEs involved in

[5] Qatar National Health Strategy 2011-2016. Available at: http://www.nhsq.info/app/media/127

efficiency and reach	• ictQATAR – Regulatory Authority • Chamber of Commerce and Industry • Ministry of Business and Trade • Qatar Post • Banking consortium	selling physical or digital goods and with more than 10 employees to offer an e-commerce platform by 2016

POLICY ACTION 4.4

Support information and entertainment-oriented content creation:

- mandatory online presence and creation of digital content by all public and media companies in Qatar, at least in Arabic
- initiate a regional effort to develop an Arabic and English aggregator infotainment portal (news, sports, gaming, music, government information etc.) that is recognised as high quality

Rationale	Stakeholder responsibility	Policy target
• Production of high-quality accessible content across multiple genres, expanding the digital inclusion of Qataris; drives take-up; over time would add to Qatari culture limits recourse to other sites where material could be inappropriate; bring some new market segments online	• ictQATAR – ICT Industry Development • Enterprise Qatar • Qatar Foundation • Qatar National Library • Katara	• 100% of government entities and media companies to have a web-presence at a minimum in Arabic by 2018

POLICY ACTION 4.5

Undertake a cross-sector strategic review to investigate the case for a wider public-sector broadcasting role in Qatar (potentially a key source of new digital content)

Rationale	Stakeholder responsibility	Policy target
• Create appealing and high-quality content to drive broadband usage	• ictQATAR – ICT Industry Development • Qatar Media Corporation (QMC) • Ministry of Culture Arts and Heritage • Qatar News Agency	• 2015

POLICY ACTION 4.6

Developing ICT-based environmental programmes, including initiatives which can contribute to the wider 'smart-cities' concept; these programmes will be an integral part of a larger national green policy framework (to be developed through a separate government initiative):

- foster consumer-driven partnerships, enabling information sharing between consumers and stakeholders (e.g. utility companies, real-estate companies, Ministry of the Environment)
- raise awareness about environmental sustainability, resource management and sustainability of the impact of ICT devices on the environment

- define incentives that will encourage a change in consumer behaviour, towards adopting low-carbon solutions
- set targets for the penetration of smart-metering technology in households, and define the strategy to reach these targets
- co-ordinate the QNBN's deployment with the deployment of smart meters, in order to use the QNBN infrastructure for the delivery of smart meter-related applications.

Rationale	Stakeholder responsibility	Policy target
• Make broadband contribute towards the reduction of Qatar's carbon footprint	• Ministry of Environment • Ministry of Energy • ictQATAR – Internet & Society	• 100% of households with smart meters and remote climate control by 2020

POLICY ACTION 4.7

- Define an IPv6 migration implementation plan, which provides a timeline of activities across the Qatar IP ecosystem. This will also include IPv6 awareness and education initiatives
- Service providers to comply with IPv6 specifications by 2015, including for CPE (conditional on IPv6 DNS availability)

Rationale	Stakeholder responsibility	Policy target
• Ensure readiness for IPv6 offering among organisations as well as service carriers	• ictQATAR – Regulatory Authority • ictQATAR – ICT Government • Ooreedoo • Vodafone	• 2014 (migration plan) • 2015 (IPv6 compliance)

POLICY ACTION 4.8

Support the creation of an application developer ecosystem and organise application development competitions

Rationale	Stakeholder responsibility	Policy target
• Encourage entrepreneurship and ICT development	• ictQATAR – Digital Innovation Centre • ictQATAR – ICT Industry Development • Ooreedoo • Vodafone • Universities consortium • Qatar Science and Technology Park • Qatar Computer Research Centre	• 2015 (first competitions)

POLICY ACTION 4.9

Determine appropriateness and benefits for the market in expanding the Regulatory Authority's mandate towards converged regulation:

- lead a consultation phase with key stakeholders in the media and broadcasting industry to understand the best path towards converged regulation
- set up a co-operative working framework with other institutions involved in the production and distribution of digital content, including leading newspapers and online portals

Rationale	Stakeholder responsibility	Policy target

• Convergence of technology, media and platforms rendering single-sector regulation obsolete	• ictQATAR – Strategic planning • Qatar Media Corporation (QMC) • Ministry of Culture, Arts and Heritage	• 2014 (assessment) • 2018 (converged regulator)

POLICY ACTION 4.10

Reinforce Qatar's cyber-security across multiple layers:

a) Draft a cyber-security strategy that includes
   - country-wide cyber-security directives to be implemented by all corporations in the country
   - awareness campaigns to all critical organisations in Qatar
   - system administrator qualification requirements for all critical organisations in Qatar
   - provisions for random inspections of cyber-defence mechanisms put in place by key corporations in Qatar (vulnerability testing)
   - penalties for the non-respect of directives

b) Accelerate the securing of vital infrastructure:
   - Government Network to migrate passive infrastructure lease to government-owned QNBN
   - QNBN to prioritise its deployment in view of requirements for redundancy of vital infrastructure
   - all government entities to be connected with redundant physical links

c) Reinforce the responsibility of national service providers in preventing cyber-attacks by mandating a minimum set of offered security solutions

Rationale	Stakeholder responsibility	Policy target
• Protect Qatar • Reinforce resiliency and support establishment of businesses	a) ictQATAR – QCERT; Cyber Security consortium of Ministries and Industry b) ictQATAR – Government Network; QNBN; Government Ministries c) ictQATAR – QCERT; Ooreedoo; Vodafone	a) 2013 (cyber-security policy in place) b) 2015 (redundant physical connectivity to critical infrastructure) c) 2014 (service providers offering minimal suite of services)

POLICY ACTION 4.11

a) Expand current Qatar University entrepreneurship programme to other universities and departments, and further develop ways to promote a risk-taking mentality among fresh graduates.

b) Leverage ICT investment opportunities identified by ictQATAR for the Incubation Centre

Rationale	Stakeholder responsibility	Policy target
• Change the mind-set towards a more entrepreneurial spirit • Encourage innovation across broader range of sectors	a) Supreme Education Council, Universities consortium b) ictQATAR – Digital Innovation Centre, Qatar Science and Technology Park, Enterprise Qatar	• 2015 (Qatar University faculties)

POLICY ACTION 4.12		
Foster the establishment of a visible and active venture-capital network in Qatar to further stimulate entrepreneurship and address financial considerations		
Rationale	**Stakeholder responsibility**	**Policy target**
• Encourage and support start-ups	• ictQATAR – Digital Innovation Centre	• 2016 (venture-capital network in place)

POLICY ACTION 4.13		
Undertake a review of digital content legislation: • further investigate the need for an amendment to existing author protection laws, penalising copyright infringements • review the legal framework surrounding protection of personal data, and pertaining to the prevention of misuse of personal information. If required, publish and enact a new privacy law for online data • determine how the requirements for copyright infringement protection (e.g. user tracing and monitoring) can be balanced against the need for user data privacy • propose a new approach to media regulation which promotes transparency of information, while ensuring that the national security of Qatar is not compromised		
Rationale	**Stakeholder responsibility**	**Policy target**
• Promote digital content creation and hosting in Qatar	• ictQATAR – ICT Industry Development • Ministry of Culture Arts and Heritage • Ministry of Justice • Doha Centre for Media Freedom	• 2016

CHAPTER 8 – IMPLEMENTATION

The targets set in the National Broadband Plan and the associated policy actions to meet those targets are very ambitious, especially for the short-term. It is therefore essential that stakeholders start acting immediately, and display sufficient commitment to successfully implement them. In addition, co-ordination between stakeholders will be required, as will a constant tracking of progress made against the set targets. As the prominent stakeholder of this plan, ictQATAR will be heavily involved in its implementation.

The activities that need to be undertaken in order to ensure the successful implementation of the policy actions:

1) Form the consortia or committees composing stakeholders within the same industry with identified policy objectives
    a. Banking institutions
    b. Cable operators
    c. Real estate developers
    d. Qatar National Spectrum Coordination Committee
2) Set up a supervisory committee that will monitor the fulfilment of the initiatives throughout the lifetime of the National Broadband Plan, as well as ensuring that the targets are met. It will be ensured that:
    a. The committee is composed of a minimum of five members, having the required broadband experience and local market knowledge across all areas that need to be addressed in this plan. This committee will need a high-level understanding of the issues at stake, including but not limited to:
        - Telecommunication and competition regulation
        - Fixed and mobile broadband technology
        - Social inclusion
        - Education and health
        - Privacy and intellectual property
        - Cyber-security
    b. Out of the five members of the supervisory committee, two will be affiliated to ictQATAR, while the other three will not have any direct affiliation with any of the other stakeholders
    c. ictQATAR forms the supervisory committee, and have it accepted by the broadest consensus of stakeholders possible.
3) Set up cross-sectoral working groups, which will be responsible for carrying out the initiatives contained in the Plan:
    a. Each stakeholder to assign a broadband champion who will represent it in front of the supervisory committee
    b. The working groups will be composed of the stakeholders' broadband champions that need to interact for the fulfilment of the relevant policy actions

c. The cross-sectoral working groups will report on a regular basis to the supervisory committee, indicating achieved progress, identifying key bottlenecks, and requesting eventual support. To ensure timely tracking, it is recommended that such reports occur on a monthly basis.

4) Define tracking mechanisms to enable both the working groups and the supervisory committee to assess progress. This will entail:

   a. Validation of understanding of each stakeholder's responsibilities for each of the initiatives. In the event initiatives have to be reassigned or changed, this will need the approval of the supervisory committee
   b. Breaking down the policy actions into a set of smaller actions by each stakeholder or cross-sector working group where necessary
   c. Assigning implementation deadlines for these sub-actions, and validate them by the supervisory committee, taking into account the need to respect overarching targets included in the Plan.
   d. Tracking target achievements

   The supervisory committee will not hold any power over stakeholders, but the latter will be accountable to the former. A representation of stakeholder involvement against all identified initiatives is provided in Figure 6 overleaf. This includes additional stakeholders from the ones appearing in the initiatives in the preceding chapters, who are to be consulted and informed, according to the principles of the RACI matrix.

Figure 6: RACI matrix of stakeholder involvement in policy actions (part 1)

Policy action	ictQATAR - Regulatory Authority	ictQATAR - Strategic Planning	ictQATAR - Digital Inclusion Department	ictQATAR - Internet & Society	ictQATAR - QCERT	ictQATAR - eGovernment	ictQATAR - Government Network	ictQATAR - Digital Innovation Centre	ictQATAR - ICT Industry Development	ictQATAR - Consumer Affairs Department	ictQATAR - ICT Government	Ooreedoo	Vodafone	QNBN	Es'hailsat	Ministry of Business and Trade	Ministry of Culture, Arts and Heritage	Ministry of Energy	Ministry of Environment	Ministry of Justice	Ministry of Municipality and Urban Planning	All government ministries	Year
1.1	R,A																						2014
1.2	R,A											C	C	C									2014
1.3	R,A											I	I	I									2014
1.4A	R,A											I	I	I									2014
1.4B										R,A		I	I	I									2014
1.5	R,A											I	I	I									2014
2.1	R											A		A							C		2014
2.2	A											I	I	I							R		2014
2.3	R,A											R		R							R		2013
2.4	A											R									C		2020
2.5	R											C	C		C								2014
2.6	R,A											I	I										2015
2.7	R,A											I	I										2016
3.1			R,A	R																			2022
3.2A																							2018
3.2B			R																			R,A	2017
3.3A						R,A						C	C									C	2018
3.3B						R,A																	2016
3.4			A									R	R		R								2014
3.5			A									R	R	R	R								2016
3.6			A									R	R										2016
3.7			R,A									C	C										2017
3.8			C	A	R							R	R		R								2015
3.9			C	R,A								C	C										2014
3.10A				R					R,A														2013
3.10B									R,A					R									2013
4.1	R,A								R			I	I										2014
4.2A						A						C	C										2016
4.2B			R,A			R																	2015
4.3	C								R							A							2016
4.4									A														2018
4.5									A								R						2015
4.6				C								C	C					R	R,A				2020
4.7	R,A										R	R	R										2015
4.8								A	R			R	R										2015
4.9	C	A															C						2018
4.10A	C				R,A																		2013
4.10B					C		A					I	I	R								R	2015
4.10C					A							R	R										2014
4.11A																							2015
4.11B								R,A															N/A
4.12								R,A															2016
4.13	C								A								R			R			2016

Figure 6: RACI matrix of stakeholder involvement in policy actions (part 2)

Policy action	Public Works Authority	Qatar National Spectrum Committee	Qatar National Library	Qatar Science and Technology Park	Qatar Computer Research Centre	Qatar Foundation	Qatar Post	Qatar Media Corporation	Qatar News Agency	Katara	Supreme Education Council	Supreme Council for Health	Supreme Council for Economic Affairs	Chamber of commerce and industry	Enterprise Qatar	Meeza Data Centre	Doha Centre for Media Freedom	Cyber security consortium (govt. and ind.)	International cable operators consortium	Real estate developerd consortium	Universities consortium	Banking consortium	Year
1.1																I							2014
1.2																							2014
1.3																							2014
1.4A																							2014
1.4B																							2014
1.5																I							2014
2.1	C																						2014
2.2																							2014
2.3													C							C			2013
2.4	C																						2020
2.5		R,A																					2014
2.6																			C				2015
2.7																			C				2016
3.1																							2022
3.2A						R					R,A						R						2018
3.2B																							2017
3.3A																							2018
3.3B														R	C								2016
3.4		C																					2014
3.5		C																					2016
3.6																							2016
3.7																							2017
3.8																							2015
3.9											R												2014
3.10A																							2013
3.10B																							2013
4.1																							2014
4.2A											R	R											2016
4.2B																							2015
4.3							C							C								R	2016
4.4			R			R				R					R								2018
4.5								R	R														2015
4.6																							2020
4.7															I								2015
4.8				R	C																R		2015
4.9								C															2018
4.10A																		R					2013
4.10B																							2015
4.10C																							2014
4.11A											R,A										R		2015
4.11B				R											R								N/A
4.12																					C		2016
4.13																	C						2016

ANNEX I: APPROACH

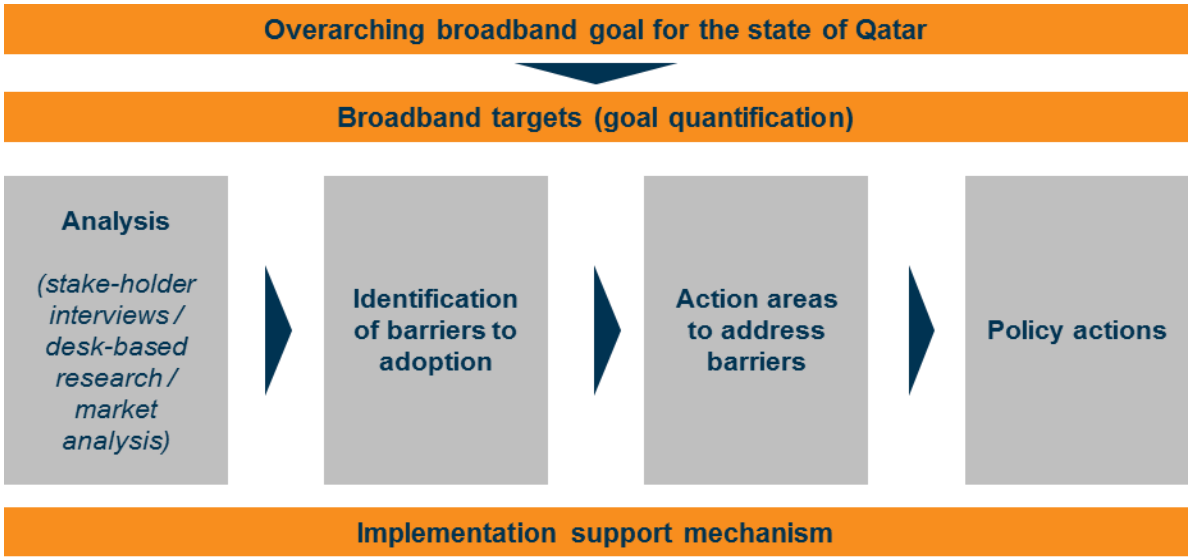
The National Broadband Plan is the result of a detailed analysis of the Qatari broadband market, combined with stakeholder consultations and the reference to regional and international benchmarks. The stakeholders were selected to provide a broad set of views and inputs, and included organisations from the private and public sectors, as well as in civil society. The stakeholders consulted during the drafting process of the Plan are referenced in Figure 7.

Figure 7: Stakeholder consultations for the National Broadband Plan

External stakeholders		Internal stakeholders (ictQATAR and affiliated entities)
Al Jazeera	Qatar Petroleum	ICT Industry Development
Doha Centre for Media Freedom	Qatar Tribune	Digital Inclusion Department
Gulf Bridge International	Qatar University	Digital Innovation Centre
North-western University	Qatari Diar	Government Network
Oryx GTL	QNBN	e-Government
Electricity & Water Co. (Kahramaa)	Ooreedoo	Q-CERT
Qatar Media Corporation	Vodafone	Regulatory Authority
		Strategic Planning

Stakeholder interviews and desk-based research, as well as a wealth of information provided by ictQATAR and other third parties, have led to the identification of the barriers to broadband proliferation. To address these barriers, a set of action areas are defined, and for each action area a set of policy actions are proposed. Finally, to ensure the timely and proper implementation of these initiatives, a control and monitoring mechanism is recommended, involving all relevant stakeholders for each of the policy actions. The structure of the broadband plan is illustrated below

Figure 8: Process followed for the drafting of the National Broadband Plan



ANNEX II: INDEX