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Middle East and North Africa Region  
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**LEBANON**

**Economic & Fiscal Impact of Introducing  
Broadband Networks and Services in Lebanon**



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# 1. Executive Summary

The impact on the Lebanese economy not to embrace broadband now would be the equivalent of Lebanon not to have embraced learning foreign languages a generation ago.

At the request of the Ministry of Finance, this report examines the economic and fiscal impact of introducing broadband networks and services in Lebanon.

Using a model developed by the World Bank, if broadband penetration had risen by 10 percentage points in Lebanon in 2008, the model predicts that GDP would have increased by between 1.2%<sup>1</sup> to 1.5% or 523,508 to 654,385 million LBP (US \$348 to 435 million) on a recurring basis and the fiscal contribution in that year would have been between an extra 117,789 to 147,273 million LBP (US \$78 to 98 million), also on a recurring basis. The corresponding capital expenditure is estimated at less than one year's increase in GDP.

This economic and fiscal impact is a part of the overall positive impact associated with broader sector reforms that would also address privatization of existing assets and full liberalization of service provision, especially in the mobile segment of the market. This report examines the impact of broadband networks and services by looking at the state of sector development in Lebanon as a whole. As is shown in the report, the context and background for the analysis indicates a need for both specific reforms to unlock the potential benefits of broadband networks and services as well as broader and deeper structural reforms in the sector to unleash the potential of a wider range of networks and services, including mobile. These reforms will include fully implementing existing policies and adopting new pro-liberalization and pro-competition policies that will enable private sector participation to overcome lagging sector development.

## *Context*

Our vocabulary is evolving. Existing words assume new meanings – burn, rip, text, game, cookie - or appear in new combinations – cyber crime, file sharing, instant message, search engine, navigation bar. Some vocabulary is entirely new – blog, podcast, Wikipedia. The range of acronyms continues to expand – MP3, P2P, SMS, BPO, DRM, NGN, VoIP, VoBB, WiMAX. This evolving vocabulary can even evoke the experience of an era – “dotcom bubble.” The common factor here is ICTs and this reflects the growing and highly significant contribution of ICTs, the Internet and broadband in particular to a new landscape of economic and social activities and relations. The new landscape is populated by new ways of performing existing activities as well as entirely

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<sup>1</sup> The result is based on the experience of 120 countries between 1980 and 2006 and is statistically significant at the 10% level

new activities – in terms of the evolving vocabulary - the “Information Society” and the “New Economy.”

ICTs offer major transformational opportunities. They can contribute to enhanced productivity, competitiveness, growth, wealth creation, and poverty reduction, and can spur the knowledge-based economy. ICTs provide the means by which knowledge is developed, stored, aggregated, manipulated and diffused. ICTs also enable participation in the global economy.

Clearly, ICTs can have an impact on everyday lives and on general economic activity, but the opportunities only materialize fully to the extent that the regulatory framework, as implemented, supports and fosters both investment in and widespread diffusion of ICTs. Absent these conditions, the promise of ICTs is unrealized. ICTs offer the prospects of rapid advancements, but if appropriate conditions are not in place, the outcome can be a rapid slide down the digital divide. Widespread access to broadband is a decisive factor to participation in the positive aspects of ICT and while Lebanon faces several issues in the narrower telecommunications sector, the broadband challenge is one that necessitates a concerted and immediate response.

## **Background**

The term “broadband” has many meanings but is referred to as speed and access to a variety of communications services. According to the OECD,

*“As an example, a 256 kbit/s connection is the bottom threshold for OECD broadband penetration statistics and is roughly five times faster than a dial-up connection. However, some ADSL subscribers are currently sold connections with theoretical line speeds up to 28 Mbit/s, more than 100 times faster than an entry-level broadband connection. Some argue that there are key differences in quality between a connection at 256 kbit/s and another at 100 000 kbit/s.”<sup>2</sup>*

In August 2008, the Council of Ministers issued a Governmental Declaration which included a commitment to the licensing of competing broadband service providers and the deployment of international, national, and metro broadband networks in line with the Telecommunication Regulatory Authority’s proposed *Liberalization Roadmap*.

The introduction of broadband networks and services are known to have a transformational effect on economic activity and social inclusion, providing a foundation for long-term economic growth and competitiveness internationally. It is indisputable that for Lebanon to enjoy the beneficial social and economic impact of broadband

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<sup>2</sup> See e.g., discussion of definition of Broadband at p. 49 in Broadband Growth and Policies in OECD Countries, OECD 2008, available at: <http://lysander.sourceoecd.org/vl=3527500/cl=14/nw=1/rpsv/~6681/v2008n4/s1/p11> The OECD is reconsidering its current threshold for download speeds of 256kbits/s. Ibid, at p. 134.

networks and services, Lebanon will need to facilitate the roll out world-class broadband networks and services in the very near future, irrespective of any timetable for the participation of the private sector in the ownership of telecommunications assets held by the State.

In the context of regional and global trade, the cost of *not* ensuring that access to broadband networks and services in Lebanon will likely exacerbate gaps in productivity and competitiveness with possible self-inflicted long term negative impact on Lebanon's economic development.

In Lebanon, broadband services are currently available at low data rates (256 – 512 kbps for residential and 1 to 2.3 Mbps for businesses),<sup>3</sup> high prices (\$44/month for residential at 512 kbps and \$200/month for 2.3/Mbps for businesses) and low penetration relative to relevant comparator countries. These factors, for example, are having a negative impact on the ability of the Lebanese private sector to compete internationally, especially in the services sectors, and in the loss of jobs to overseas locations with better quality and less expensive communications costs, including international links.

In terms of economic and fiscal impact, recent reports in the United States have claimed that there is a direct correlation between the growth in broadband and job creation. In the United States, growth of broadband lines of “0.01 per capita from 2004-2006 resulted in 0.6% growth in employment”.<sup>4</sup> The impact is even greater if one considers the “multiplier” and “network effects” that come with broadband deployment. It is estimated that between 100,000 (on the low end) and 250,000 jobs are created for every US\$5 billion invested in broadband in the United States.

In other countries the positive effect on capital spending, boosting service industries such as tourism, media and entertainment, finance and other advisory work, as well as the multiplier effect on employment are compelling.

### ***Structure of Report and Summary of Recommendations***

*Pro-liberalization and pro-competition enabling policies are at the core of successful broadband development.* This report begins in Section 2 with an overview of summary of best practices regarding policies and incentives that can catalyze broadband deployment. Section 2 shows that countries that are currently enjoying the benefits of broadband communications capacity (networks and services) have all embraced – through pro-active, enabling policies – a level of private sector led investment and competition in the sector that stimulate demand through promoting access.

*The Lebanese market is not performing up to its potential.* Section 3 then outlines the current status of the Lebanese telecommunications market, with a focus on benchmarking Lebanon's broadband market against its regional neighbors. The overall

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<sup>3</sup> Lebanese households and SMEs are typically connected at low 128-256 kbps speeds.

<sup>4</sup> Crandall, Lehr & Litan, “The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data”, The Brookings Institution, 2007.

market performance of the sector in Lebanon is disappointing as a consequence of minimal competitive pressures which result in limited supply and high prices. In addition, Lebanon is trailing behind its neighbors in almost all aspects of broadband networks and services. As discussed in Section 6, Lebanon's poor performance in broadband is a drag on economic growth. This is having a negative impact on jobs, consumer prices for these services and Lebanon's competitiveness in the 21<sup>st</sup> century global economy (witnessing losses of services industry jobs overseas).

*There are a number of constraints on the deployment of broadband in Lebanon.* The report then discusses the principal constraints to broadband development in Lebanon in Section 4. A broad range of factors (including market structure, technical, timing, regulatory and policy considerations) is negatively affecting Lebanon's ability to fully embrace the advantages of rolling out quickly high-speed broadband networks and services at affordable prices to consumers. A comprehensive approach to dealing with these constraints is required.

*Lebanon also performs poorly vis-à-vis its neighbors.* Understanding how Lebanon's broadband market is positioned vis-à-vis its neighbors and the constraints placed on realizing the benefits of broadband sets the foundation for the summary discussion in Section 5 of various factors affecting decision making regarding different options for launching deployment of broadband networks and services. While there are many considerations for broadband deployment – timing, coverage, technology – and each of the considerations is relevant to designing a broadband deployment strategy for Lebanon – a single, simple message emerges: For Lebanon to realize a competitive position, to retain jobs and to reap the economic and fiscal benefits that are the promise of broadband, Lebanon needs to enable the widest, deepest, broadest possible deployment of broadband as quickly as possible.

*The positive economic and fiscal impact of the roll out of broadband networks and services in Lebanon is expected to be significant.* Section 6 shows that the deeper the penetration there is for high speed broadband, the greater the economic and fiscal benefits will be. In the case of Lebanon, a 10 percentage point increase in broadband penetration in Lebanon would result in a recurring 1.38% increase in the growth rate of GDP per capita, equivalent to US \$400 million per year, with an annual fiscal contribution resulting from this additional growth estimated at a US \$90 million per year on a recurring basis. The capital expenditure associated with this growth is likely to be significantly less than the increase in GDP for one year.

## 2. Summary of Global Best Practice

This section provides a brief overview of global best practice principles to support the growth in the supply and take up of broadband. These best practice principles typically focus on three aspects: the policy and regulatory framework, initiatives to develop access, and programs to spur adoption. It concludes by linking these best practices to the broadband policy environment in Lebanon.

Universal access to broadband networks and services is a policy objective of nearly all jurisdictions. In many countries these policy objectives are supported by enabling policy (including market structure) and regulatory incentives. For example in February 2004, the OECD Council adopted its Recommendation on Broadband Development<sup>5</sup> which calls on member countries to implement a number of policy principles to assist the expansion of broadband markets, to promote efficient and innovative supply arrangements, and to encourage effective use of broadband services.

The European Commission stated “It is a prime objective of the EU’s i2010 strategy – ‘a European Information Society for growth and employment’ – to accelerate the roll-out of advanced broadband communications and create an open and competitive single market for information society and media services within the EU. Under i2010, the Commission targets the year 2010 for high-speed broadband lines being available everywhere in Europe.”<sup>6</sup>

The *Seoul Declaration for the Future of the Internet Economy*<sup>7</sup>, adopted in 2008 by 30 OECD member countries, nine non-member economies and the European Community, recognized the centrality of broadband to economic development. The Declaration includes agreed policies for the internet economy and identified the need for two specific broadband related policies to:

- Stimulate investment and competition in the development of high capacity information and communication infrastructures [broadband] and the delivery of Internet-enabled services within and across borders; and
- Ensure that broadband networks and services are developed to attain the greatest practical national coverage and use.

The Declaration emphasized that ICT policies are no longer narrow sectoral policies but rather mainstream economic policies “which encompass creativity, convergence and confidence”. In this context in 2008 the OECD undertook its bi-annual survey of ICT policies<sup>8</sup> which ranked the priorities of the respondent countries. The first ranked priority, of 25, was “government on-line or as model user”. This ranking is not

<sup>5</sup> OECD (2004). Recommendation of the OECD Council on Broadband Development C(2003)259/FINAL [http://www.oecd.org/document/36/0,3343,en\\_2649\\_34223\\_34238436\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/36/0,3343,en_2649_34223_34238436_1_1_1_1,00.html)

<sup>6</sup> MEMO/06/132 Date: 21/03/2006

<sup>7</sup> <http://www.oecd.org/dataoecd/49/28/40839436.pdf>

<sup>8</sup> Chapter 7, “OECD Information Technology Outlook 2008”



surprising since only governments can implement such policy objectives. The second ranked priority was “broadband uptake and use”.

The signatories of the Seoul Declaration represent a very high proportion of total global investments in broadband. Though each of these signatories have designed and implemented country-specific policies to support the development of broadband they have applied a set of common policy principles.

### **(a) Policy and regulatory framework**

Most countries emphasize competition and a significant role for private sector investment to spur the growth of their broadband markets. The success of the competitive process relies on actions that enhance security and trust, and a regulatory framework that sustains investment. The principles also accept the limitations of the competitive process in ensuring broadband for all and assign a role for government intervention in correcting any sub-optimal performance.

In many countries, these policy objectives are supported by specific enabling policy (including market structure) and regulatory incentives. For example in February 2004, the OECD Council adopted its Recommendation on Broadband Development<sup>9</sup> which calls on member countries to implement a number of policy principles to assist the expansion of broadband markets, to promote efficient and innovative supply arrangements, and to encourage effective use of broadband services.

Broadband was not included in the OECD survey of 2002, yet by 2004 the OECD Council adopted the *Recommendation of the Council on Broadband Development*. The Recommendation calls on Member countries to implement a set of policy principles to assist the expansion of broadband markets, promote efficient and innovative supply arrangements, and encourage effective use of broadband services.

The foundations of these common policy principles were established in the above mentioned Recommendation and these principles can be considered as global best practice against which the practices in Lebanon can be benchmarked. The common policy principles of the Recommendation are reproduced below:<sup>10</sup>

- Effective competition and continued liberalization in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, non-discriminatory market policies

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<sup>9</sup> Recommendation of the OECD Council on Broadband Development. Adopted by the Council at its 1077<sup>th</sup> Session on 12 February 2004.

<sup>10</sup> “Broadband Growth and Policies in OECD Countries”

[http://www.oecd.org/document/36/0,3343,en\\_2649\\_34223\\_34238436\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/36/0,3343,en_2649_34223_34238436_1_1_1_1,00.html)

- Policies that encourage investment in new technological infrastructure, content and applications in order to ensure wide take-up
- Technologically neutral policy and regulation among competing and developing technologies to encourage interoperability, innovation and expand choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks
- Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market
- A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and more generally, strengthened cross-border co-operation between all stakeholders to reach these goals
- Both supply-based approaches to encourage infrastructure, content, and service provision and demand-based approaches, such as demand aggregation in sparsely populated areas, as a virtuous cycle to promote take-up and effective use of broadband services
- Policies that promote access on fair terms and at competitive prices to all communities, irrespective of location, in order to realise the full benefits of broadband services
- Assessment of the market-driven availability and diffusion of broadband services in order to determine whether government initiatives are appropriate and how they should be structured
- Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights, and digital rights management without disadvantaging innovative e-business models
- Encouragement of research and development in the field of ICT for the development of broadband and enhancement of its economic, social and cultural effectiveness

### **(b) Developing Access**

The OECD, based on the survey of supporting policies practiced by member countries, has identified particular policy initiatives that would promote broadband investments. These include policies:

- To improve access to passive infrastructure (conduit, poles, and ducts) and to co-ordinate civil works as an effective means to encourage investment
- To ensure access to rights of way in a fair and non-discriminatory manner
- To encourage and promote the installation of open-access to passive infrastructure when public work are undertaken
- To allow municipalities or utilities to enter telecommunication markets. Where there are concerns about market distortion, policy makers could limit municipal participation to basic investments (*e.g.* the provision of dark fiber networks under open access rules)

- To provide greater access to spectrum (which is a significant market barrier to wireless broadband provision) and to adopt more market mechanisms to promote more efficient spectrum use

### **(c) Programs to spur adoption**

The Seoul Declaration has been adopted by 30 OECD member countries, nine non-member economies and the European Community, recognized the centrality of broadband to economic development.

The Declaration includes agreed policies for the internet economy and identified the need for two specific broadband related policies to:

1. Stimulate investment and competition in the development of high capacity information and communication infrastructures [broadband] and the delivery of Internet-enabled services within and across border
2. Ensure that broadband networks and services are developed to attain the greatest practical national coverage and use

The Declaration emphasized that ICT policies are no longer narrow sectoral policies but rather mainstream economic policies “which encompass creativity, convergence and confidence.”

The EU has taken a wide ranging approach to encourage broadband adoption with initiatives targeted at the production of digital content<sup>11</sup> where on-line content will generate €8.3bn in revenues by 2010 in the EU, supported by a new digital copyright Directive<sup>12</sup>. The EU has also introduced various initiatives to enhance media and e-literacy as well as providing direct support for the production of digital content including films. These actions by the EU recognize the importance of compelling content to households if they are to take up broadband.

As illustrated in the table below, policies to promote broadband can be implemented for both the supply and demand sides with both direct and indirect impacts. The availability of digital content has an indirect influence on the demand for broadband but this is vital to the household sector which would be unwilling to invest in home equipment and broadband subscriptions merely to obtain e-public services.

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<sup>11</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0836:FIN:EN:PDF>

<sup>12</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0029:EN:HTML>

Table 1: Policies to Support Broadband

Supply-side		Demand-side	
Direct	Indirect	Direct	Indirect
Licensing more operators	Investment in new technology incentives	PC access	Broadband applications
Licensing costs	Economic investment stimulus packages	Digital literacy programs	Digital local content
Spectrum availability and licensing		Tax incentives	E-government strategies
Universal Service Fund for broadband			E-public services

It is thus essential that Lebanon adopts a holistic view of broadband that covers the policy and regulatory framework, connectivity and access, and the adoption of these networks, services, and their related applications.

#### **(d) The status of broadband policy in Lebanon**

The above policies are already reflected in the broadband agenda in Lebanon<sup>13</sup> and the above policies<sup>14</sup> should be regarded as key *elements* of best practice. However, investments in broadband<sup>15</sup> have to be supported by appropriate legal and regulatory instruments to ensure their take up. In this regard supporting policies and associated instruments are required to:

- Introduce effective competition and liberalize infrastructure, network services and applications, including mobile broadband services and content
- Promote the business use of broadband and e-commerce
- Resolve disputes in the use of advanced mobile (wireless) broadband services and associated content in order to facilitate of new market entrants
- Ensure government services and government content are available online and increasingly on mobile services providing digital public-sector content
- Support broadband applications in social sectors such as tele-work, education, energy, health, and transport

The application of the best practice common policy principles in combination with the implementation of the specific policies to encourage investment will provide a major stimulus to broadband in Lebanon which can be measured by an increase in GDP

<sup>13</sup> See e.g. “Draft Broadband Policy” presented to the Minister of Telecommunications, August 2008, “Draft Broadband Licensing Plan” issued by the TRA for consultation in May 2009, and the “TRA “Study on the Use of Public Property””.

<sup>14</sup> See *supra* note 9 and text accompanying.

<sup>15</sup> See Chapter 6 for illustrative capital expenditure sums for Lebanon.

growth per capita. The implementation of best practice policies and associated instruments to encourage take up of broadband, where the Government of Lebanon can be a major digital content provider, will then strengthen this trajectory.

**(e) Conclusion**

Countries that are currently enjoying the benefits of broadband communications capacity (networks and services) have all embraced – through pro-active, enabling policies – a level of private sector led investment and competition in the sector that stimulate demand through promoting access.

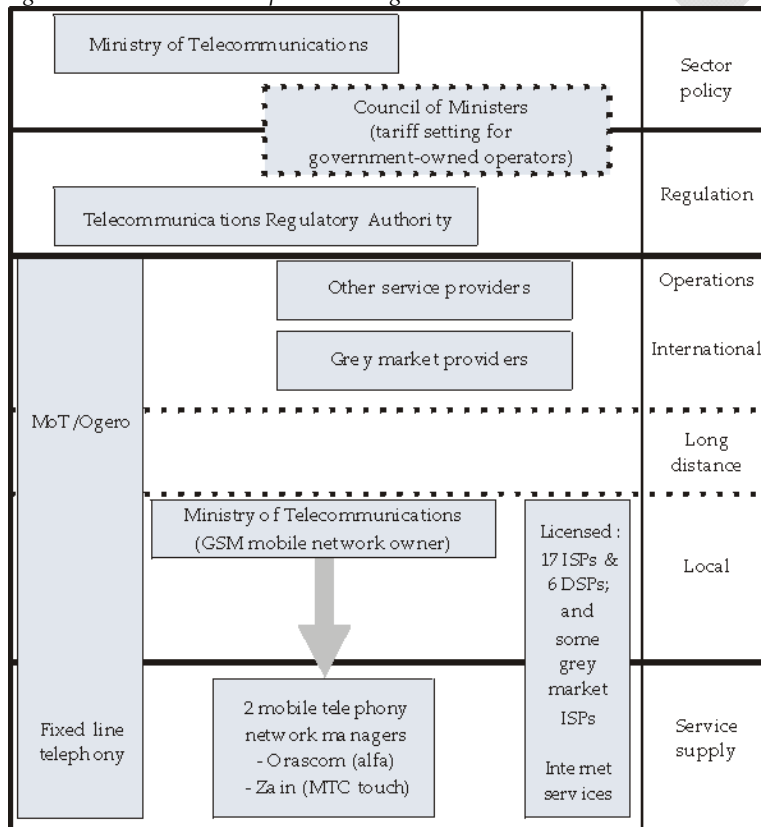
### 3. The Lebanese Telecoms Market & Benchmarking

This section begins with an overview of the Lebanese telecommunications market, including the policy and legal/regulatory framework and the market structure. Based on that overview, this section benchmarks Lebanon against countries in the region on key broadband indicators.<sup>16</sup> Despite its pioneer status in the region in telecommunications, Lebanon’s telecommunications market now lags behind its peers, especially regarding broadband. As is demonstrated later in the report, this has a dampening impact on economic growth and slows fiscal contributions.

#### (a) Market Overview

The overall market structure in Lebanon for electronic communications is illustrated in Figure 1 and Table 2. This represents a transitional phase pending full implementation of Law 431/2002. For example, under Law 431, the Council of Ministers has no tariff setting responsibilities.

Figure 1: Roles and Participants During Transitional Phase



<sup>16</sup> This report focuses on benchmarking indicators that are most relevant to the broadband segment of the market. Additional sector benchmarking indicators are available.

## **(b) Legal/Regulatory Framework**

The new telecommunications legal framework (Law 431/2002 of July 2002<sup>17</sup>) was enacted in 2002. It is regarded as reflecting good international practice in establishing credible, independent, transparent, non-discriminatory and proportionate regulation of the sector, but it is not yet fully implemented. The TRA was established under the law with the appointment of its five member board in 2007. However, shortly after establishment, one of its board members resigned. The respective powers, duties, functions and responsibilities of MoT and TRA are set forth in the Law. TRA's powers and duties include, for example, the following:

- Issuing regulations, order and decisions;
- Technical and economic regulation;
- Competition regulation;
- Interconnection regulation;
- Spectrum management and monitoring;
- Drawing up frequency plans and assigning frequencies;
- Drawing up numbering plans and assigning numbers;
- Dispute resolution;
- Licenses issuance;
- Tariff regulation;
- Inspection and investigation;
- Imposing penalties, fines and sanctions; and
- Standardization and type approval.

Since its founding, the TRA has promulgated a number of regulations under the Law (for example the regulation on Significant Market Power, Interconnection, Quality of Service and Type Approval). It has also undertaken a number of public consultations regarding a variety of sector issues. Most recently, TRA has initiated a consultation on the deployment of broadband services (including, *inter alia*, its Draft Broadband Policy Licensing Plan and Liberalization Roadmap) as well as on a new regulation on use of public properties.

## **(c) Overall Market Structure**

Following is a description of Lebanon's telecommunications sector. It describes and analyzes the different segments of the market and identifies the possible impediments that are holding these markets back from improved performance.

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<sup>17</sup> The Law is available at: <http://www.tra.gov.lb/Library/Files/Uploaded%20files/TelecomLaws-Lebanon2002English.pdf>

Table 2 below provides an overview of the different market segments and their size, along with information about the key players in each segment.

Table 2: Overview of market structure<sup>18</sup>

Service	Owner	Operator	Market Size
Fixed	State	MoT/OGERO	750,000
GSM Mobile	State	(alfa) Orascom	900,000
	State	(MTC Touch) Zain	1,200,000
DSL	State	MoT/OGERO	90,000
	Various Private	n/a	10,000
Internet Services	State	MoT/OGERO	51,000
	Various Private ISPs	n/a	29,000
Data Services	State	MoT/OGERO	58,000
	Various Private DSPs	n/a	22,000
E1 Line Provision <sup>19</sup>	State	MoT/OGERO	37%
	Various Private	n/a	63%
CATV	Various formal private	Cable Vision, EcoNet, Digitek	N.A.
	Various unlicensed		750,000 <sup>20</sup>

The Government of Lebanon, via the Ministry of Telecommunications (MOT) is the dominant player in all sub-sectors of the market with the exception of Cable TV, where unlicensed service providers play a key role, and the provision of leased lines (E1). Both of these sub-sectors could play a role in the provision of broadband services. As a consequence of the market structure MOT makes crucial sector-wide decisions regarding investments and tariffs. Additionally Law 431 provides for a legal obligation to provide a form of Universal Service on Licensed Telecommunications Operators,<sup>21</sup> while there is no explicit funding for these activities. This position regarding investment in the sector is further complicated due to the competing demands on public finances.

Some remedial action has recently been undertaken. In February 2009, based on the recommendation of the MOT and the supporting opinion of the TRA, the Council of Ministers approved a reduction in the prices of mobile services. These price reductions combined with MOT investments into mobile networks, together with the new management fee structure (which creates incentives to expand the subscriber base) have resulted in renewed marketing efforts by the managers of the two mobile service providers, a shift from pre-paid to post-paid subscribers, and recent increases in mobile

<sup>18</sup> Data collected by World Bank Team during March 2009 visit to Lebanon.

<sup>19</sup> Percentage market share.

<sup>20</sup> Households.

<sup>21</sup> Currently there is no legal obligation for Ogero to provide universal service since it has not yet been given a license by TRA.



penetration, yet there was no improvement in the Quality of service to the consumers who are still suffering poor quality of service (high drop call ate, etc...)

### (d) **Current Data and Broadband Market**

Lebanon was an early mover in 1996 when the Internet was introduced. Now the data communications market is fully liberalized at the retail level with 23 licensed service providers—including 17 Internet (ISPs) and six data service providers (DSPs) mostly from the private sector though MOT has a significant presence in the market as the owner of the access and core networks. Wireless-based broadband Internet services were introduced in Lebanon in 2004 for residential market. Wireline-based broadband Internet services, using Digital Subscriber Line (DSL) technology began in May 2007 by MoT/OGERO and the private DSP/ISPs. Since then, the number of DSL subscribers has reached around 80,000 by end 2008. The subscriptions represent about 11 percent of the subscribers to the fixed telephony network.<sup>22</sup>

All existing ISPs and DSPs were issued new *interim* licenses by TRA in April 2008, which were renewed in December 2008 for one year. DSPs use wireless technology and provide ISPs with infrastructure connections between their points of presence and their customers. Often there is a corporate relationship between an ISP and a DSP. All ISPs and DSPs rely on MOT’s international gateway for capacity.

The DSPs and ISPs currently operate under short term licenses and rely on MoT/OGERO for access to essential facilities, which account for a high proportion of their costs. Some of these operators were also given access to spectrum, some of which (namely 2.5 Ghz) they undertook to release without compensation at the request of MoT . As shown in the table below<sup>23</sup>, despite having lower retail prices than MoT, in DSL for example, the private operators have a relatively small share of the market.<sup>24</sup>

Table 3:ISP Tariffs for DSL services

Residential	128 Kbps		256 Kbps		512 Kbps		1024 Kbps		2.3 Mbps	
	Fee (US \$)	Cap (GB)	Fee (US \$)	Cap (GB)	Fee (US \$)	Cap (GB)	Fee (US \$)	Cap (GB)	Fee (US \$)	Cap (GB)
MoT	23	2	33	3	47	4	77	5	200	8
Sodetel	19/27	2/UL	23/36	3/UL	40	4	70	5	na	na
Terranet	19	2	23	3	40	4	70	5	na	na
IDM	19	2	23	3	40	4	70	5	na	na
Cyberia	19	2	23	3	40	4	70	5	na	na
Wise	19	2	23	3	40	4	70	5	150	6

Note : prices are subject to 10% VAT

<sup>22</sup> Republic of Lebanon, Telecommunication Regulatory Authority - White Paper on DSL Market in Lebanon (White Paper), at p.4. Available at: <http://www.tra.gov.lb/library/files/uploaded%20files/ads1%20white%20paper%20%20-%20%20final.htm>

<sup>23</sup> *Ibid.*

<sup>24</sup> MoT’s retail prices are, on average, 26% more expensive than the prices offered by private operators.

As of March 2009, the price charged by MOT for a 2 Mbps E1 line was US\$2,700 per month in comparison to \$446 per month for similar capacity Istanbul – London or \$1,074 Frankfurt – Istanbul<sup>25</sup>.

Internet (DSL) penetration is relatively low and is expected to pass 10% in 2010 however household penetration rates are noticeably higher. Numerous factors have been suggested as contributors to the low penetration including the market structure, high prices, limited international bandwidth and regulatory bottlenecks<sup>26</sup>. The retail tariff of MOT for a data rate of 1 Mbps was reported by TRA as \$77 per month<sup>27</sup> which is 3 times the price charged in Morocco (see Table 5). TRA also reported substantial unmet demand for broadband services.

The lack of competition in the whole sale broadband segment of the market has limited the growth of international connectivity (bandwidth), and has allowed prices to remain high. Lebanon thus has the lowest bandwidth per capita in the region, and prices are much higher than other regional markets. MoT/OGERO's dominance also has implications for competition and the quality of service. TRA will have to enforce fair allocation of bandwidth, and enforce quality of service standards to ensure that downstream markets (e.g. broadband Internet) can perform efficiently. Liberalization will significantly ease these constraints.

Competition policy issues arise due to the reliance of the private data operators on MOT for essential inputs to their businesses in markets in which the private sector and MOT both compete. These issues have been documented by TRA.<sup>28</sup> Any such practices are likely to slow down the take up of broadband and data services.

### **(e) International Benchmarks**

Table 4 illustrates the relative position of Lebanon in the provision of electronic communications in comparison to its near neighbors. Lebanon holds a middle position regarding fixed services and the internet. In the neighborhood Lebanon is somewhat laggardly with respect to broadband. Strikingly, Lebanon is the worst performer for the take up of mobile services. This is striking since Lebanon was one of the first in the neighborhood to offer mobile services in 1994. In 2006 the mobile market in Lebanon started to fall behind in terms of growth in penetration. In comparison, mobile services were not introduced to Iraq until 2002 but the country has now achieved a mobile penetration rate of nearly double that of Lebanon.

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<sup>25</sup> Source: Telegeography Research.

<sup>26</sup> Frontier Economics, *Market Assessment*, 2008

<sup>27</sup> See White Paper,

<sup>28</sup> Ibid

Libya has a similar market structure to that prevailing in Lebanon – one state owned fixed operator and 2 state owned mobile operators. In Libya the mobile penetration rate is over 100%<sup>29</sup> and the compound rate of growth (2004 to 2009) of the sector has been over 120% compared to Lebanon’s 13%. It is reported that in the MENA region only Yemen has a lower mobile penetration rate than Lebanon. As discussed elsewhere in this report, one factor that contributes to Lebanon’s poor sector growth is the lack of effective competition among state-owned assets.

Table 4: Lebanon and its near Neighbors (+ Qatar) Penetration Rates %- 2008

	Mobile	Fixed	Internet*	Broadband
Qatar	201.0	28.9*	10.4	10.8
KSA	148.6	16.5*	8.9	4.1
Cyprus	131.3	48.8*	13.5	20.1
Israel	128.1	42.7*	27.6	22.3
Jordan	95.6	9.8*	3.8	3.2
Iran	64.9	34.6	23.4	1.8
Iraq	63.2	4.7*	na	na
Palestine	53.9	9.1	3.2	1.9
Syria	35.4	17.4	3.5	0.1
Lebanon	34.9	18.3	8.6	2.0

\* 2007

Source: Telegeography, ITU 2007

The consequences of the absence of competition in the mobile sector of Lebanon are evident in the tariffs charged (high<sup>30</sup> and largely undifferentiated) and the limited range of tariff packages on offer, as of February 2009 only 4 packages (2 of both post and pre-paid) in Lebanon and compared to 50 in Jordan, in addition to the poor quality of service and the lack of new services.

This low mobile penetration rate has a potential impact on the development of the mobile broadband market in Lebanon. Generally these markets are driven by four factors: 1) sufficiently high GDP per capita; 2) poor/limited fixed infrastructure; 3) high mobile penetration; and 4) the early introduction of 3G. For example, South Africa has a similar GDP per capita as Lebanon (\$5,960), relatively limited fixed infrastructure (10% penetration), high mobile penetration (approaching 100%) and 3G was launched in 2005. As of Q1 2009, there were 890,000 mobile broadband subscribers in South Africa or 6% of all mobile subscribers in the country. 3G has yet to be launched in Lebanon.

Section 6 of this report, dealing with the evidence of the economic impact of broadband, and discusses the importance of the contributory role of complementary investments in providing for the success of broadband investments. The following table

<sup>29</sup> The leading mobile operator in Libya has over 6,000,000 subscribers and is ranked 15<sup>th</sup> in the Top 50 list of operators in Africa.

<sup>30</sup> A report by the Arab Group found average pre-paid tariffs in Lebanon the highest of nine countries in the region.

provides some insights on the relative strengths and weaknesses of Lebanon in this regard. The ITU has constructed a composite weighted index which measures the development potential of a country with respect to ICT. Overall Lebanon is ranked 64<sup>th</sup> of 154 countries by this ICT development Index (IDI).

Table 5: Lebanon and its near Neighbors (+ Qatar) Internet Related indicators 2008

	IDI Rank*	Bandwidth+	% households with computer	% households with Internet
Israel	29	7,190	62	45
Cyprus	37	14,649	53	39
Qatar	44	6,624	34	34
KSA	55	1,932	43	36
Lebanon	64	289	40	38
Iran	78	423	13	9
Jordan	76	831	25	11
Palestine	79	3,376	33	16
Syria	89	304	35	30

\*ICT Development Index. +International Internet Bandwidth per Internet user (bits/s).

Source: ITU "Measuring the Information Society", 2009

The top ranked country by the IDI is Sweden with a score of 7.50, Cyprus scores 4.97, Lebanon 3.45, Syria 2.66 and Libya 2.84. The other three columns in Table 4 contribute to the overall ranking. Noticeably Lebanon scores well in terms of percentage of households with computers and percentage of households with the Internet. These are important indicators of complementary investment necessary for the success of broadband investments. But Lebanon scores very lowly in terms of available international Internet bandwidth. For example, Libya has identical 'household' scores to those of Lebanon but its bandwidth result is 1,064 more than 3 times that of Lebanon. Clearly the on-going efforts to increase international Internet bandwidth will both raise the ranking of Lebanon and the expected success of investment in broadband.

A deeper examination of the IDI illustrates the strengths of Lebanon where it is ranked 53<sup>rd</sup> on 'ICT use' and 55<sup>th</sup> on 'ICT skills' – clearly advantageous for successful broadband investments. The index also illustrates the weaknesses. Lebanon is ranked 65<sup>th</sup> in an ICT Price Basket and 100<sup>th</sup> (i.e. where first is cheapest) for the Mobile Price Basket Index where Cyprus is ranked 9<sup>th</sup> (least expensive), KAS 24<sup>th</sup>, Iran 45<sup>th</sup> and Jordan 60<sup>th</sup>. In terms of the Fixed Broadband Internet Price Basket index Cyprus is ranked 7<sup>th</sup>, KAS 43<sup>rd</sup> and Lebanon 57<sup>th</sup>. These rankings indicate that the broadband market in Lebanon is probably more competitive than the mobile market despite the competition policy issues. The IDI also indicates that broadband investments in Cyprus are more likely to be successful than in Lebanon.

Morocco was ranked 80<sup>th</sup> in the Fixed Broadband Internet Price Basket index but since the time of the IDI study mobile broadband has been introduced and there is increasing competition between fixed and mobile operators. Table 6 illustrates the tariffs for 3G and DSL broadband at various data rates from the various competitors following tariff reductions for DSL by Maroc Telecom.

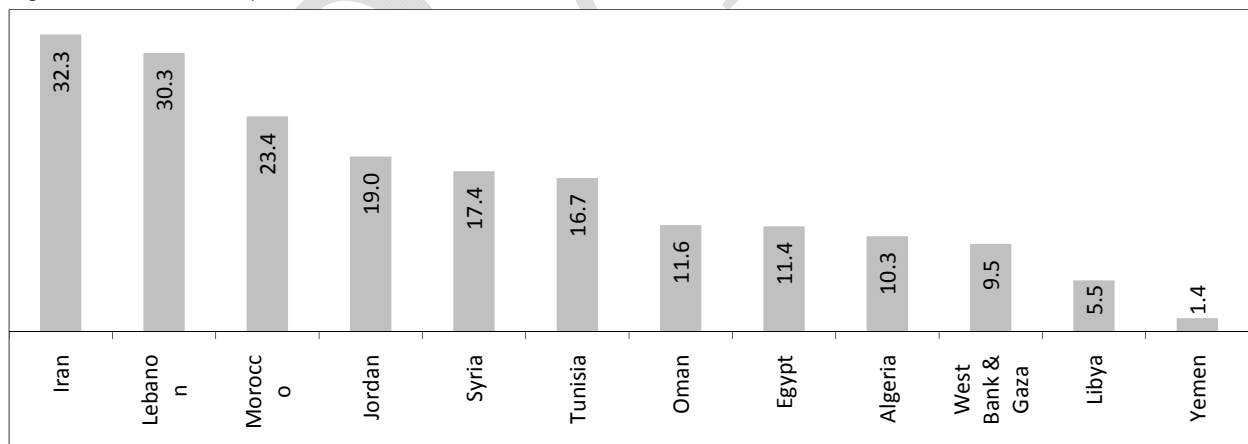
Table 6: Mobile Broadband and DSL Tariffs per month in Morocco, 6th April 2009

Mobile – 3G			Fixed - DSL
Wana	Meditel	Maroc Telecom	Maroc Telecom
128 Kbps for \$16			128 Kbps for \$13
			256 Kbps for \$17
	512 Kbps for \$26	512 Kbps for \$26	512 Kbps for \$20
1 Mbps for \$26			1 Mbps for \$26
	1.5 Mbps for \$45	1.8 Mbps for \$45	
			2 Mbps for \$39
	3.5 Mbps for \$58	3.6 Mbps for \$58	
			4 Mbps for \$78
	7.2 Mbps for \$103		

Using a different dataset of comparator countries reveals additional anomalies.

Statistics are difficult to obtain because ISPs do not publish subscriber data and because of black and grey market activities. However, estimates from both legal and grey market ISPs put the number of residential Internet subscribers at around 300,000, about half of which connect legally.<sup>31</sup> Data from the ITU suggests that about 30 percent of the population uses the Internet, up from 9 percent in 2000. This puts Lebanon in a strong position regionally.

Figure 2: Internet users (per 100 inhabitants)<sup>32</sup>



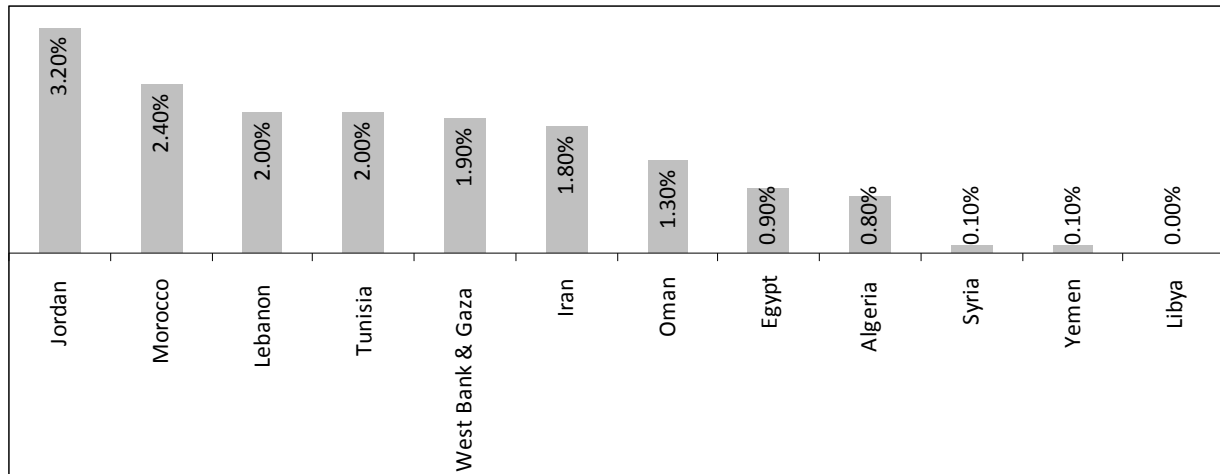
Consequently, the market penetration of broadband Internet services remains small. However, it is among the leaders in the region, with a 2 percent penetration as of December 2008 compared with an average of 1.44 percent.<sup>33</sup>

<sup>31</sup> Estimate based on World Bank data, Paul Budde Communication, Lebanon: Telecoms Market Overview & Statistics, February 2009

<sup>32</sup> ITU data, 2008

<sup>33</sup> TeleGeography, 2009

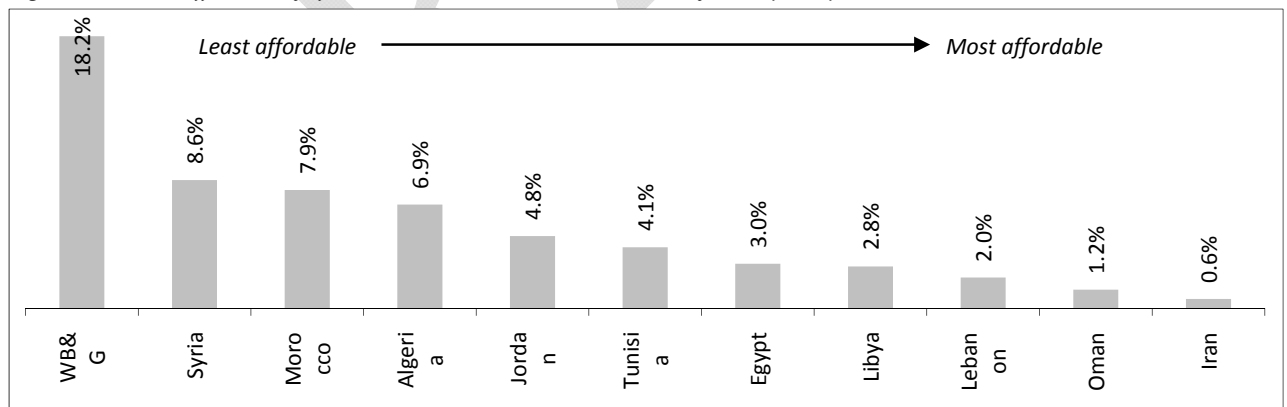
Figure 3: Market penetration of broadband Internet services (subscriptions per 100 inhabitants, 2008)<sup>34</sup>



TRA has defined a goal of 400,000 broadband Internet subscribers by 2017, i.e. about 10 percent penetration, and at speeds of 10 Mbps (residential) and 1 Gbps (business). To achieve that, Lebanon will have to grow at a compounded annual rate of 24 percent between now and then. It is thus critical that broadband licenses are issued in 2009 and that the regulatory environment to enable this growth, and attract a level of investment that will sustain it is in place.

Prices of Internet services are relatively low, with the price basket for dial-up Internet services at about US\$10.<sup>35</sup> This also makes Lebanon's Internet services relatively more affordable than the regional average.

Figure 4: Relative affordability of Internet services: Price basket/monthly GDP per capita<sup>36</sup>

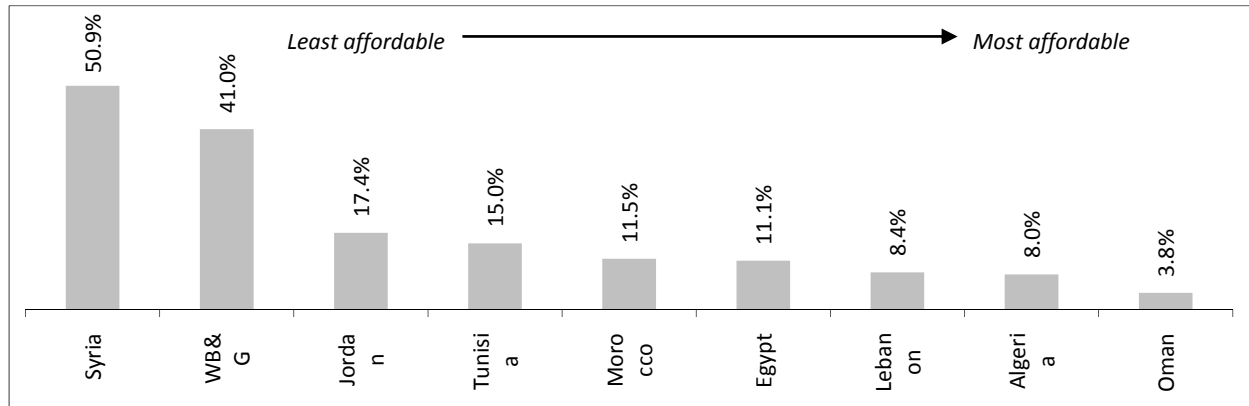


<sup>34</sup> *Ibid.*

<sup>35</sup> Price basket for Internet is calculated based on the cheapest available tariff for accessing the Internet 20 hours a month (10 hours peak and 10 hours off-peak). The basket does not include the telephone line rental but does include telephone usage charges if applicable. Data as of 2007.

<sup>36</sup> Analysis based on ITU data, 2008

Figure 5: Relative affordability of broadband services: monthly subscription to ADSL 512 Kbps/monthly GDP per capita<sup>37,38</sup>



However, there are still signs that prices might be too high and caps on usage too low (3GB, 4GB, etc. ) and an additional charge for exceeding the usage. In one survey, 39 percent of respondents said they did not subscribe to Internet services because subscription fees were too expensive. About a third also said that installation was expensive. Only 10 percent cited unavailability in their areas as the barrier to subscription.<sup>39</sup> These high prices are likely the outcome of the high costs that competitive service providers face, and which are passed on to consumers. These high costs could result from a range of factors, the most critical of which is the impact of the continued dominance of MoT/OGERO on the Internet services market.

Lebanon is placed among the lowest international Internet bandwidth capacities in the region in both absolute and per capita terms. The limited availability of international bandwidth has also become a bottleneck for the provision of broadband Internet services. Estimates of bandwidth needed to accommodate the growth of DSL subscribers was around 8 STM1 (about 1.2 Gbps) in the first year of operation of DSL services. When the market reached about 80,000 subscribers, MoT had only acquired 6 STM1 (900 Mbps), or 75 percent of the required capacity for estimated Internet traffic.<sup>40</sup>

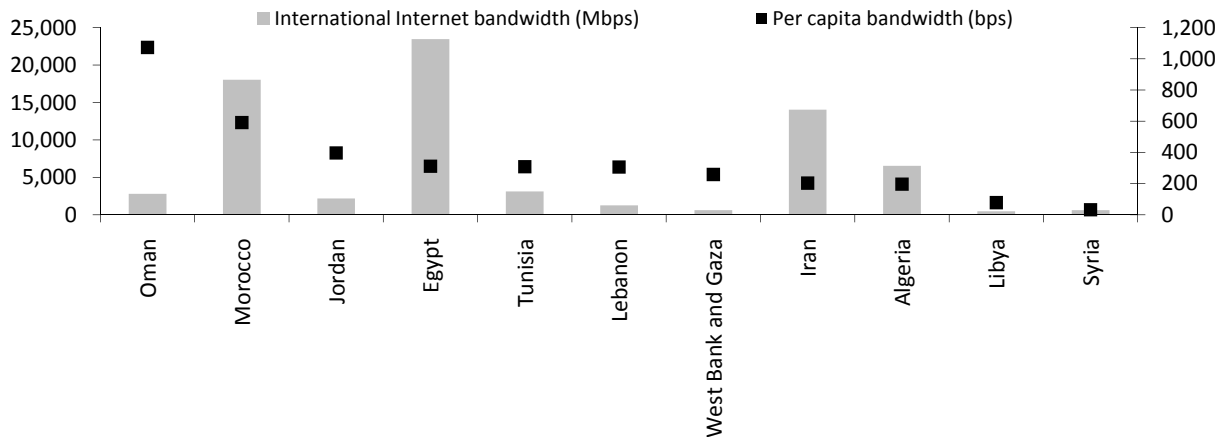
<sup>37</sup> This graph does not take into account bit-caps—limits on the amount of data a user can download/upload—and hence is only indicative of the relative affordability.

<sup>38</sup> World Bank analysis based on Arab Advisors Group, ADSL Rates in the Arab World: A Regional Comparison, December 2008; data for Iran and Libya was not available.

<sup>39</sup> TRA, Telecommunications usage patterns and satisfaction in Lebanon, December 3, 2008

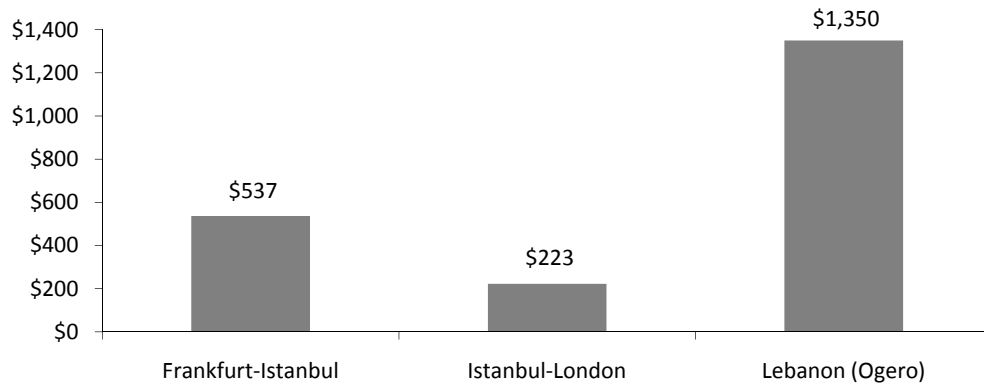
<sup>40</sup> The MoT owns stakes in three international fiber-optic cable systems: Syria-Lebanon ('Berytar', 46.9 percent), launched 1997, 5Gbps, 134km, Tartous (Syria) to Beirut; Cyprus-Lebanon ('Cadmos', 38 percent), launched 1995, 2x622 Mbps, 230km, Pentaskhinos (Cyprus) to Beirut; and Egypt-Syria ('Aletar', 6.25 percent), launched 1997, 5Gbps, 787km, Tartous (Syria) to Alexandria (Egypt). Two satellite earth stations also provide international links.

Figure 6: International Internet bandwidth



When combined with the dominance of MoT/OGERO on the market, limited availability has led to very high prices for wholesale connectivity. As of March 2009, MoT/OGERO's price for a 2 Mbps E1 line is US\$2,700/month, or US\$1,350/Mbps/month. This is very high for the capacity offered when compared with global standards.

Figure 7: Comparative cost of connectivity (US\$/Mbps/month)



## (f) Conclusion

In summary, the overall market performance of the sector in Lebanon is disappointing as a consequence of minimal competitive pressures which result in limited supply and high prices. In addition, Lebanon is trailing behind its neighbors in almost all aspects of broadband networks and services. As discussed in Section 6, Lebanon's poor performance in broadband is a drag on economic growth. This is having a negative impact on jobs, consumer prices for these services and Lebanon's competitiveness in the 21<sup>st</sup> century global economy (witnessing losses of services industry jobs overseas).



## 4. Constraints to Broadband Deployment

In previous sections this report has outlined global best practices for enabling broadband and described the current status of the broadband market in Lebanon vis-à-vis its neighbors. This section explores existing constraints on Lebanon's ability to address its poor performance.

A number of existing constraints<sup>41</sup> – resulting from incomplete implementation of the structural reforms required under Telecommunications Law 431/2002, the uncertain policy regarding broadband (described in section 2.d., above), as well as the current status of the legal and regulatory framework and the existing market structure – are having a negative impact on the deployment of broadband services and networks in Lebanon. This section summarizes those constraints. The next section evaluates these constraints in light of what appear to be the various options for licensing broadband networks and services.

The delay in incorporating Liban Telecom through the merger of MoT and OGERO's operations into a corporate entity and the constraints placed on the ability of TRA to effectively regulate MoT/OGERO are contributing factors to (i) the lack of effective competition in the sector generally, (ii) the apparent abuse of a dominant position by MoT/OGERO regarding the provision of wholesale services to DSPs, (iii) the delay in the provision and capacity of high-end broadband services, and (iv) the persistence of high prices. In addition, the short-term, temporary licensing structure and issues with frequencies currently applicable to operators and service providers in the private sector provides little incentive for long-term investments in infrastructure. Furthermore, MoT continues to perform some regulatory functions which should be transferred to TRA under the law, resulting in some regulatory uncertainty in the market.

Some officials interviewed for this report indicated that introducing broadband licensing without limitations on mobility now might negatively impact the value of Lebanon's mobile network assets in a future privatization context (by introducing competition) while others indicated that the asset value was already low and that the impact, if any, on privatization would rather likely be limited. However, in that context, a revenue stream would still be anticipated because those assets comprise essential facilities in the Lebanese telecommunications market. This uncertainty as to the effect of liberalization of broadband may have on the state's existing telecommunications assets will likely be a contributing factor in the determination of the timing, scope and manner (national and "metro", terrestrial and wireless (fixed and mobile) pre-privatization vs. post-privatization) in which additional broadband networks and services are introduced in Lebanon.

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<sup>41</sup> Among others, these constraints include the fact that the Telecommunications Law (2002) (Law) is not fully implemented, a position is vacant on the TRA Board, and MoT/OGERO do not operate under licenses issued by TRA under the Law.

### **(a) Market Structure (Liban Telecom / Mobile Privatization)**

In the context of this report, the failure to privatize Liban Telecom and the two mobile networks has at least four consequent effects: (i) it places on the State the burden of providing necessary investment in telecommunications networks; (ii) it causes regulatory uncertainty; (iii) it has generally slowed development of the sector; and (iv) it has impeded the rollout of broadband services.

Under the Law, MoT/OGERO's operations were to be converted from a government department to a joint stock company with a Board, Liban Telecom. Liban Telecom has been formed legally (the decree creating it and approving its articles of incorporation were approved in 2005), but its Board has not yet been appointed, thus the full corporatization of Liban Telecom, including the allocation to it of a license by TRA, is still pending. As a result, the State continues to be responsible for investment in the network. The continuing unlicensed status of OGERO causes regulatory uncertainty. Service providers are intended to be licensed under the Law, yet Lebanon's biggest and most important telecommunications operator remains unlicensed resulting in imbalances in the sector. Concerns have been expressed that licensing broadband services prior to the privatization of Liban Telecom would negatively affect potential investor interest in Liban Telecom.

With respect to the two mobile networks, as mentioned elsewhere in this report, in addition to resulting in a lack of incentives for the two contractors to invest in these networks and provide additional services, there is a concern that licensing broadband services before these networks are privatized would similarly negatively affect potential investor interest in the mobile privatization, especially if broadband licenses were frequency based. At the same time, it would appear that the current contractors providing mobile services would be well placed to offer broadband wireless services and migrate their customers to broadband wireless platforms. These possibilities will be of major concern to potential investors willing to invest in the Broadband market as they would tend to balance the negative impact on Broadband business from mobile Operators offering broadband wireless services.

### **(b) Exclusive Rights**

In addition, the continuing fixed line service monopoly, and constraints placed on the ability of TRA to effectively regulate OGERO/MoT arising from its unique position in the market, are contributing factors to (i) the lack of effective competition in the sector generally, (ii) the resulting dominant position by MoT/OGERO regarding the provision of wholesale services to DSPs and potential abuses of that dominant position, (iii) the delay in the provision and capacity of high-end broadband services, and (iv) the persistence of high prices.

### **(c) International Connectivity**

High prices for international communications services access<sup>42</sup> is having a dampening effect on the Lebanese economy, shifting services industry business and even jobs overseas. In its White Paper on DSL Market in Lebanon (2009), TRA has described the shortfalls of MoT to meet consumer demand for market-based pricing and bandwidth capacity, which has resulted in a bottleneck. While benchmarking indicates that prices for outgoing calls is about mid-range in the region, demand is still outstripping supply.

### **(d) Access to Public Properties / Building Codes**

Access to public rights of way and other public infrastructure (ducts, poles, antenna sites, etc.) has also been identified as a constraint to rolling out broadband networks and services in a competitively neutral manner. Establishing procedures that ensure predictable, fair and equitable access to these essential facilities for private sector operators, is a necessary condition for private sector broadband providers to enter the market. TRA has produced a draft decree that would address the asymmetry in access to these public infrastructures, and it would appear evident that resolving the manner in which private operators access these essential facilities will need to be resolved prior to licensing of broadband networks and services.

### **(e) Spectrum (availability and pricing)**

In addition to access to essential facilities and infrastructure, the availability of adequate frequency spectrum will be essential for the provision of wireless broadband services on a predictable, fair and equitable basis. This section describes some of the current constraints on the availability of spectrum.<sup>43</sup> Lebanon has committed to the timetable established by the ITU for the conversion from analogue to digital broadcasting technologies (“Digital Switchover” or “DSO”) by 2015. One positive consequence of Digital Switchover in Lebanon will be the freeing up of significant portions of spectrum from former analogue broadcast uses to a wider range of digital services (sometimes known as the digital dividend).<sup>44</sup> This spectrum, in addition to the spectrum made available through the spectrum “refarming” exercise currently being undertaken by TRA,

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<sup>42</sup> Tariffs are among the highest in the region and make service unaffordable relative to per-capita incomes. As of 2007, the monthly price basket for residential fixed telephone service was US\$14.97 and US\$20.14 for mobile telephone service. This was equivalent to 3.1 and 4.1 percent of gross domestic product (GDP) per capita per month (US\$488). In 2007, the average for regional peers (Algeria, Egypt, Iran, Jordan, Lebanon, Libya, Morocco, Oman, Syria, Tunisia, and West Bank and Gaza ) was 2.7 percent for fixed telephone service, and 3.9 percent for mobile telephone service. Hence, Lebanon’s telephone services were, on average, relative more expensive than for regional peers. All figures are for 2007, data from ITU, 2008.

<sup>43</sup> E.g., the *ad hoc* allocation of frequencies to some DSPs and subsequent redistribution agreements, potential frequency refarming and consequent impact on potential liberalization and availability of 2.5G and 3G frequencies.

<sup>44</sup> In the United States, for example, some of this liberated frequency fetched US\$20 billion when it was auctioned in 2008.

could contribute to the implementation of a broadband rollout strategy that involved fixed and wireless solutions, underscoring the importance of the Digital Switchover. However, the planning process for the Digital Switchover has yet to be completed.

### **(i) Digital Switchover**

Wireless broadband services require sufficient frequencies. An essential component of ensuring that sufficient frequency spectrum is available is liberating frequencies from current analogue uses, including broadcasting, and reallocating them to digital use. Digitization allows more efficient use of frequencies. The same content that could be sent using analogue technologies can, because of digitization, be compressed and sent using less spectrum and at higher quality. With more and more content being digitized, more spectrum is available for use. In order for this to happen, current analogue services, including especially broadcast services, would need to be converted to digital services (so-called “digital switchover”). Implementing digital switchover will “liberate” frequency that can be allocated and assigned to various digital purposes, including broadband telecommunications services.

### **(ii) Refarming**

In light of the foregoing, TRA has recently undertaken a frequency “refarming” exercise<sup>45</sup> which aims, in part, at taking liberated frequencies, rationalizing them and reassigning sufficient frequency bands to be assigned for wireless broadband networks, services and applications. The current frequency plan will need to be revised in order to accommodate new uses of frequency for wireless broadband. As such, it will be an essential part of ensuring successful wireless broadband deployment in Lebanon. The situation with respect to liberating sufficient frequency for broadband has been further complicated by the fact that some, but not all operators, entered into a Memorandum of Understanding (MoU) with MoT. These undertakings make it simpler to reform, except that these undertakings were signed by those operators who had been assigned frequency in the 2.5 band and not others (e.g. 3.5 and 1900).

### **(f) Existing Licensee Transition**

The short-term, temporary licensing structure for operators and service providers and issues with frequencies<sup>46</sup> currently applicable to operators and service providers in the private sector provides little incentive for long-term investments in infrastructure. Furthermore, MoT continues to perform some regulatory functions which should be transferred to TRA under the law, resulting in some regulatory uncertainty in the market.

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<sup>45</sup> See the Consultation document and related information at:

[http://www.tra.gov.lb/Library/Files/Uploaded%20files/Spectrum\\_Refarming\\_and\\_Packaging.pdf](http://www.tra.gov.lb/Library/Files/Uploaded%20files/Spectrum_Refarming_and_Packaging.pdf)

<sup>46</sup> E.g., the *ad hoc* allocation of frequencies to some DSPs and subsequent redistribution agreements, potential frequency refarming and consequent impact on potential liberalization and availability of 2.5G and 3G frequencies.

### **(g) Black/Grey Market**

High tariffs on fixed and international services have led to a grey market of voice-over-Internet protocol (VoIP) based telephony service providers. Another practice has been to establish an illegal wire hook-up to junction boxes on OGERO's telephone network.<sup>47</sup> Both practices are undesirable: while a grey market undermines the credibility of the regulatory framework and hides otherwise taxable revenues, the pilferage of service imposes unrecoverable costs on OGERO and results in unfair competition to licensed operators. Future policy should address mechanisms to bring these black and grey market activities under legal and regulatory control.

### **(h) Conclusion**

A broad range of factors (including market structure, technical, timing, regulatory and policy considerations) is negatively affecting Lebanon's ability to fully embrace the advantages of rolling out quickly high-speed broadband networks and services at affordable prices to consumers. While for purposes of this report, these constraints have been discussed separately, they should be viewed collectively, and a comprehensive approach undertaken to deal with them as a whole as well as individually. Moreover, the individual issues under this comprehensive approach need to be addressed in parallel and not necessarily in sequence. For example, addressing the spectrum issue is important in its own right and does need to be addressed, but will only go so far in addressing issues related to broadband deployment. Access to ducts and other public properties will also need attention. And ensuring that there is fair access to frequencies and civil works will only go so far without addressing fundamental issues related to MoT/OGERO's monopoly status in the market.

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<sup>47</sup> TeleGeography, Lebanon wireline market commentary, January 2009

## 5. Considerations in Designing a Broadband Deployment Strategy

Having reviewed the constraints to Lebanon's addressing weaknesses in its broadband market in Section 4, this section provides a summary of the various factors affecting decision making regarding different aspects to consider when launching deployment of broadband networks and services. These considerations should be undertaken understanding how the constraints in Section 4 affect those options as well as how the options undertaken can contribute to overcoming those constraints.

For purposes of this section it is assumed that broadband licenses would be awarded subject to an open and competitive tender process based on transparent and objective selection criteria. It is also understood that the TRA has recently launched (4 May 2009) a consultation process on its proposed Broadband Licensing Plan and network requirements, which addresses many of these issues.<sup>48</sup> The various decision points discussed in this section, and how they are implemented, can affect the extent to which broadband deployment will have an economic and fiscal impact in the country. Key among these decisions and their implementation is timing. A delay in introducing broadband will consequently delay the potential economic and fiscal impact described in Section 6, below.

Additionally, while there are many considerations for broadband deployment – timing, coverage, technological, number of licenses – and each of the considerations is relevant to designing a broadband deployment strategy for Lebanon – a single, simple message emerges: For Lebanon to realize a competitive position, to retain jobs and to reap the economic and fiscal benefits that are the promise of broadband, Lebanon needs to enable the widest possible deployment of broadband as quickly as possible. Section 6 shows that the deeper the penetration there is for broadband the greater the economic and fiscal benefits will be. In that sense these considerations are not intended to be rivalrous. Rather, each should be taken into account in designing a comprehensive strategy for rapid roll-out

### (a) *Timing – Before/After Privatization*

The first and key consideration is the timing of launching broadband licenses for broadband networks and services *vis-à-vis* privatization of Liban Telecom and the two mobile networks. Here the consideration is what, if any, effect the launching of such licensing will have on those privatizations and whether, on balance, the potential downside to privatization will be outweighed by the benefits to the economy of introducing broadband networks and services now. The key potential downside would appear to be that launching broadband before privatization would tend to depress potential investor interest in Liban Telecom and the two mobile networks (balanced, of

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<sup>48</sup> See, <http://www.tra.gov.lb/Broadband-Licensing-Plan-and-Broadband-Network-Requirements>

course, by potential investor interest in the existing customer bases of the current operators). The benefits are principally outlined in Section 6.

The benchmarking analysis in Section 3 suggests that there is a need for better and more broadband services in Lebanon while the economic and fiscal analyses in Section 6 shows the benefits.

In terms of fixed, or terrestrial broadband services, it would appear that the success of broadband licensing would depend primarily on whether there is competitively fair access to essential fixed infrastructures. With limited DSL penetration given its monopoly status, it would appear that MoT/OGERO could be better exploiting the market, but is not. The question, then, is whether the benefits of waiting to launch broadband for a private investor in Liban Telecom is outweighed by the overall benefits to the economy of launching broadband licenses before privatization. It is unclear that potential investors would rather invest in the private provision of broadband or seek to do so through OGERO. However, as described in TRA's Broadband Licensing Plan consultation, the question is largely moot if OGERO *cum* Liban Telecom will benefit from a National Broadband Carrier License (NBCL). The analysis in Section 6 implies that without broadband, the potential value of the assets to be privatized will diminish overtime.

With regard to the mobile networks, the key consideration, as discussed below, would be whether broadband providers (presumably only the so-called "National Broadband Licensees (NBL) under TRA's Broadband Licensing Plan consultation) would compete directly for existing mobile customers. Since the existing mobile networks offer services at the 900 MHz range, and since wireless broadband services would be offered at higher frequencies, it would therefore appear that the key question would be whether the contractors currently offering 900 MHz services would be able to compete for wireless broadband services, and in this case, the question will depend on the difference in the Total Cost of Ownership between the NBCLs and the Mobile operators. . In that sense, it would also appear that access to the existing wireless infrastructure for purposes of providing wireless broadband would be of interest to a provider of wireless broadband, but not essential, given the difference in frequencies. However, as with fixed broadband, the key will be competitively fair access to those facilities for wireless broadband providers.

### **(b) Coverage and Licensing Options - National vs. "metro"**

The next consideration is the coverage obligations contained in broadband licenses. Here there are two basic options - whether broadband licenses would be on a national *or* "metro" basis ("metro" meaning that licenses would be for predetermined metropolitan areas) or national *and* metro. The national *vs.* metro option is a mutually exclusive choice. Licenses are either on a national basis or a metro basis. The national *and* metro option is not exclusive. This means that both national and metro licenses

could be issued. In the latter scenario, there are obviously more choices for investors to consider, and more potential investors across Lebanon. This could enable local consortia to bid for and provide services in local areas. It is noted that in the TRA's Broadband Licensing Plan consultation, questions are posed regarding the timing of issuing NBCLs and NBLs.

One issue to guard against is the potentially anti-competitive effect of allowing all operators to compete in all market segments. This is particularly true of MoT/OGERO, who could use its current market position unfairly. Application of normal competition principles should be sufficient to ensure that market dominance does not result from the licensing process.

### **(c) Application**

Finally, consideration must be given to whether these licenses should be given to only existing players and whether these should be terrestrial or wireless.

#### **(i) New vs. Existing Market Players**

Limiting participation in new broadband licenses to existing players in the Lebanese market would provide those market participants an enhanced ability to leverage their existing positions and potentially provide an opportunity to level the playing field in a fragmented and asymmetric market. However, such a limitation would run counter to the principle of non-discrimination and equal opportunity to all interested applicants if the new broadband licenses – such as the National Broadband and Carrier Licenses (NBCLs) are limited in number for a few years, which is often required to encourage investments in networks and to create infrastructure-based competition.

On the other hand, opening the competition to newcomers would be more likely to bring market efficiencies, innovation in terms of technology and service offerings, yielding higher quality networks and services forcing incumbents to put their best offer forward. Opening competition would likely yield better results in terms of the revenues that may be generated from an auction of the radio spectrum. This consideration would also affect the timing issue of the NBCLs and the NBLs.

#### **(ii) Terrestrial vs. Wireless**

As with the national vs. metro or national and metro debate, another option is to license terrestrial vs. wireless broadband networks and services or terrestrial and wireless services (or to do so on a technology neutral basis). While these not need be exclusive, one could argue, for example, that only terrestrial networks and services will be licensed so as not to interfere with current wireless operations. However, as discussed above, since the wireless broadband services would be qualitatively different than current wireless offerings and are offered at different frequencies, there would appear to be no logical reason not to offer wireless broadband licenses. In addition, offering both terrestrial and wireless licenses would appear to appeal to a wider set of potential



investors or at least promote a potentially wider array of potential investors. Investors in terrestrial networks and services could conceivably offer both wholesale and retail services. Wireless licenses would provide incentives for existing wireless providers to leverage their current businesses to an existing customer base and encourage new entrants to offer a burgeoning array of new wireless services.

#### A. Limited vs. Full Mobility

If a decision were made to proceed with wireless licensing, either in connection with terrestrial licenses or not, a further consideration is whether those licenses would be for full or limited mobility. Broadband wireless services with full mobility (e.g., 3G or WiMax services) are not a direct competitor with existing mobile services. They are enhanced services that are not necessarily a substitute for 2G (GSM 900 MHz services). Broadband wireless services are qualitatively different than current mobile services in Lebanon. In this sense the decision as to whether to license wireless broadband services and the effect it may have on privatization of Lebanon's existing mobile networks depends on the structure of the privatization. That is, if the existing mobile operators are allowed to compete in the tender for wireless broadband services, they may see it as an opportunity to leverage their existing customer base to migrate towards new wireless broadband services.

The licensing of wireless broadband service providers with full mobility may require the approval of the Council of Ministers, which will also decide on the timing of the privatization of the mobile network assets. It is to be noted that licensing any spectrum that allows for full mobility without a clear authorization to provide mobile services will lead to a much lower valuation of the spectrum that will be offered.

#### **(d) Conclusion**

The foregoing considerations, in addition to the matters raised in TRA's Broadband Licensing Consultation, need to be taken into account in designing a comprehensive broadband deployment strategy. As shown in Section 6, the broader, wider and deeper broadband penetration at the highest capacity can be in Lebanon will affect the depth of the economic and fiscal impact of broadband on the Lebanese economy. Accordingly, these considerations should only be used as inputs in designing a broadband rollout strategy that maximizes penetration, bandwidth and rollout. For the reasons described, ubiquitous, early rollout of broadband is not likely to negatively affect existing operators' market valuations, as long as there are no restrictions on entry. A table summarizing these conclusions follows, showing that there is no reason not to proceed with broadband deployment.

Table 7: Considerations for Broadband Deployment

Consideration	Issues	Conclusions
Privatization	Rollout Broadband prior to Privatizing Liban Telecom	TRA has proposed reserving an NBCL to Liban Telecom
Coverage	National or Metro Coverage	Both are necessary. Ensure entry based on fair competition
Application	Limit to Existing Operators or allow New Operators	Allow any technically qualified operator to participate
	Terrestrial and Wireless	Both are necessary. If licensed in a technology neutral manner, there would be no reason not to permit both
	Limited Mobility	Broadband (3G services) are qualitatively different than current mobile service offerings. Probably no affect on GSM 900 operations

## 6. Projected Economic and Fiscal Impact Analysis of Introducing High-Speed Broadband in Lebanon

Earlier sections of this report have set forth the background for the economic and fiscal impact analysis that follows. The benchmarking and best practice show that Lebanon is lagging behind its neighbors in delivery of certain broadband networks and services, and that as a result, Lebanon's local telecommunications market is not growing as fast as others. Moreover, Lebanon is paying certain opportunity costs (loss of service sector jobs to overseas locations, *e.g.*) for not providing higher capacity and more competitively priced broadband services. This section lays out the economic and fiscal opportunity cost of not deploying broadband networks and services now, irrespective of the timetable for privatizing the State's residual telecommunications assets.

Broadband deployment is a global phenomenon with over 500 million subscribers in 2008. Broadband has recently featured as key components of stimulus packages in several countries, due to the positive impact it has on enhanced productivity and job creation. As such, deployment of high speed broadband networks and services is a policy priority in many countries. Based on an econometric model developed by the World Bank, a 10 percentage point increase in broadband penetration in Lebanon would result in a recurring point estimate of 1.38 percentage point<sup>49</sup> increase in the growth rate of GDP per capita, equivalent to US \$400 million per year. The fiscal contribution resulting from this additional growth is estimated at a recurring US \$90 million per year. Applying a range estimate of 1.2 to 1.5 percentage points the model predicts an increase in GDP of 523,508 to 654,385 million LBP (US \$348 to 435 million) on a recurring basis and a yearly fiscal contribution of between an extra 117,789 to 147,273 million LBP (US \$78 to 98 million), also on a recurring basis.

The capital expenditure associated with broadband investments to achieve this growth is likely to be significantly less than the increase in GDP for one year. Certain knowledge-based products attain the status of a "general purpose technology" (GPT) which enable and sustain long term growth and innovation. GPTs include steam power, the internal combustion engine, electricity, plastic and the micro-processor whose impacts can be regarded as transformational. Investment in broadband, as with many new technologies, has started slowly and on proving its value has expanded rapidly. Broadband is a strong candidate for GPT status. The table below illustrates the growing ubiquity of broadband.

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<sup>49</sup> The result is based on the experience of 120 countries between 1980 and 2006 and is statistically significant at the 10% level

Table 8: Growth of Broadband penetration globally

Year	Countries with Broadband	Countries with penetration > 10%
2000	36	0
2002	71	3
2004	131	10
2006	166	40
2008	180	58*

\* Provisional

In addition, broadband is seen as having a “multiplier” effect (*i.e.*, increasing in broadband access results in additional increases in other related activities). Broadband availability stimulates business activity, spurs upstream investment and creates new industries.

The following are examples of the economic impact that broadband deployment has had in other countries.

Broadband investments are a global phenomenon, for example in 2008 there were nearly 2 million subscribers in Colombia, over 3 million in Argentina, 6 million in Mexico and 10 million in Brazil, with the global total of subscribers exceeding 500 million up from 300 million in 2006. Most recently, in the United Kingdom, for example, the Government issued a Universal Service commitment to ensure that 100% of the population can obtain access to broadband services of a minimum of 2 Mbps.

In the current economic climate broadband is a candidate for “stimulus package” funds, for example in Australia, Ireland, Japan, Canada, the United States and the EU<sup>50</sup>. In this regard the OECD (2009) comments, “New broadband infrastructure investments are good targets for economic stimulus spending because many projects can be initiated relatively quickly, are labour-intensive, can minimize economic leakages, and may promise stronger marginal impacts on supply and productivity than investing in established networks such as electricity, gas, water and transportation”.

In the United States, for example, recent studies have shown a number of impressive statistics related to the economic impact of broadband deployment.<sup>51</sup> In terms of direct and indirect employment, estimates suggest that for each US\$5 billion in broadband investment, between 100,000 and 250,000 jobs are created. Employment in communities with broadband increased at a faster rate than those without. In the United States, the broadband network multiplier is found to be one of the sources expected to

<sup>50</sup> <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/142>

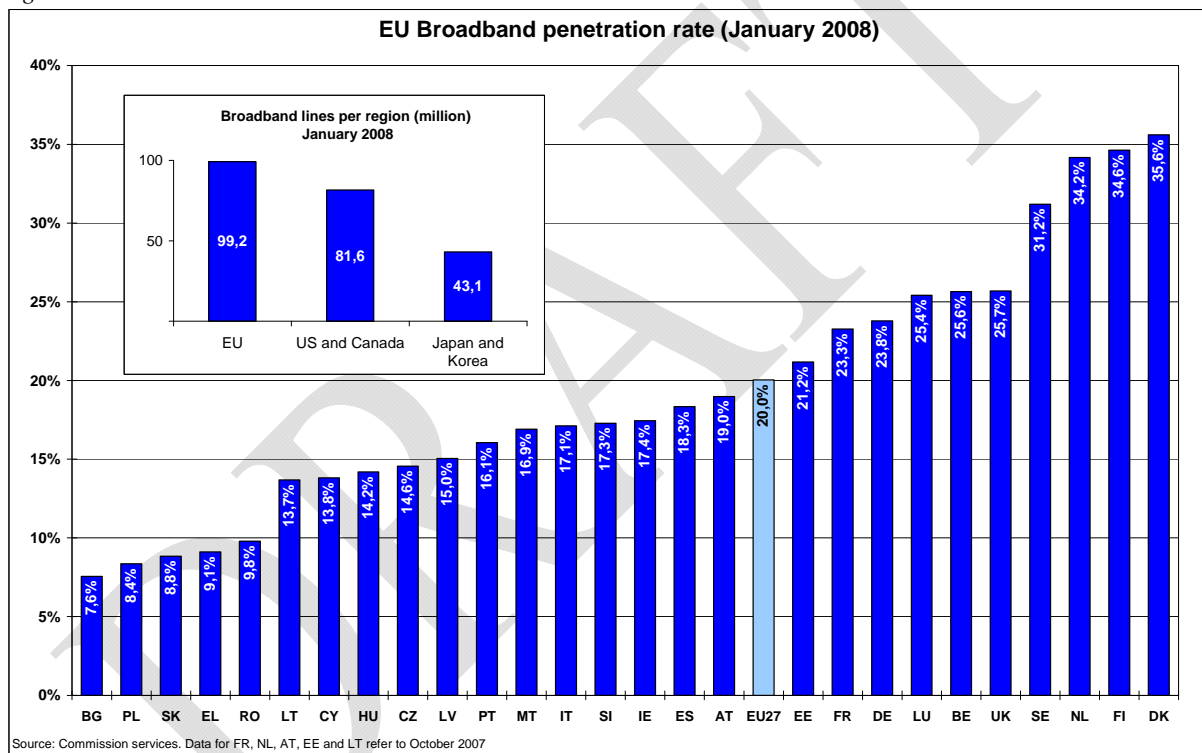
<sup>51</sup> See *supra* note 3, Crandall, Lehr & Litan.

spur employment.<sup>52</sup> For every one percent increase in broadband penetration, employment rises from 0.2 to 0.3 or approximately 290,000 jobs.<sup>53</sup>

The explosive growth in broadband and associated investments has been linked to essential and supportive technical and legal/regulatory changes that both fed into these developments while being spurred on by them at the same time. This process is illustrated in Figure 9 below for the EU.

The members of the EU have gradually assumed a leading position for broadband access having caught up and overtaken the “Asian Tigers”. Currently some of the smaller EU states have the highest broadband penetration with the average for the 27 members standing at over 20% at 2008 which represents a high level of associated investments.

Figure 8: EU Broadband Penetration rate (2009)

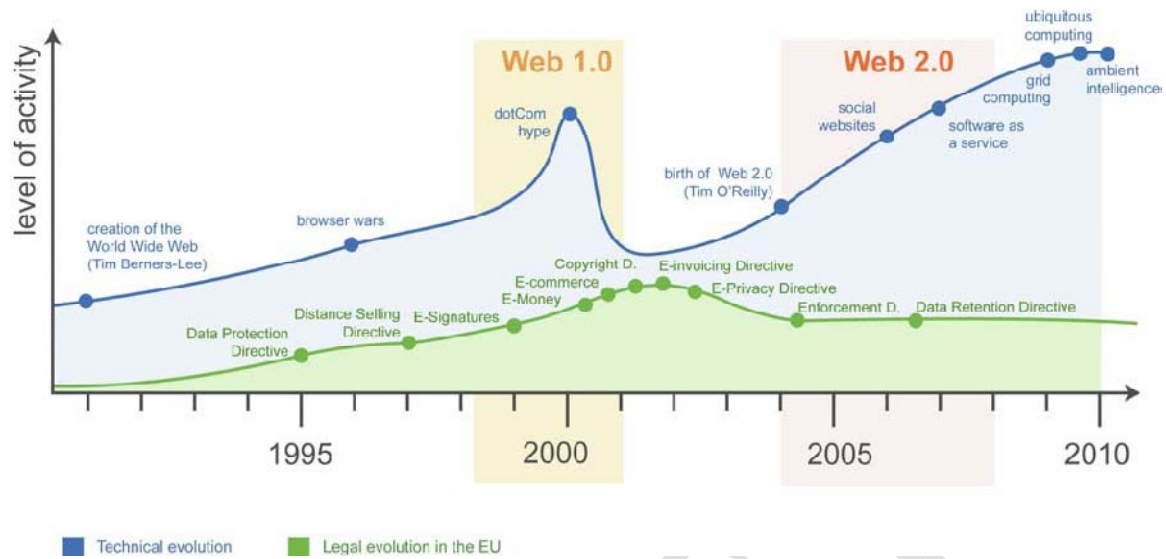


Source : [http://ec.europa.eu/information\\_society/europe/i2010/docs/annual\\_report/2008/i2010\\_mid-term\\_review\\_en.pdf](http://ec.europa.eu/information_society/europe/i2010/docs/annual_report/2008/i2010_mid-term_review_en.pdf)

Figure 9: Evolution of the legal and technical landscape in the EU

<sup>52</sup> ITEF.

<sup>53</sup> See *supra* note 3, Crandall, Lehr & Litan.



Source: DLA Piper, 2007<sup>54</sup>

### (a) **Direct and Indirect Economic Impact of Investment in Broadband**

Investments have an impact on the economic performance of an economy. Investments (capital deepening) stimulate aggregate demand and thereby cause economic growth – this is the direct impact. But productive investment will also provide indirect or “spill over” outcomes which impact the supply side of the economy since they shift the production possibility frontier of the economy – *i.e.* they lay the foundations for future growth.

When investment is made in a road aggregate demand rises providing for growth. This growth lasts for the construction period and is magnified by the multiplier effect until this fades to zero. But as long as the road is not a ‘road to nowhere’ the use of the road will expand the production possibilities of the supply-side economy, enhancing productivity, opening new opportunities and lowering costs. This stimulus to growth will endure over the productive life of the road. Investments in broadband can be treated in an analogous manner where the spill-over effects will include facilitating trade, raising productivity, improving competitiveness, reducing longer term costs, expanding access to larger markets and providing opportunities for new businesses with new business models. Such developments would encourage economic diversification and reduce exposure in the economy to economic downturns.

<sup>54</sup> Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0199:FIN:EN:PDF>

## **(b) Impact Studies**

A large body of literature exists, dating from the 1980s, on the economic impact, in terms of growth and productivity, of investment in ICT, particularly telecommunications. Generally the econometric and case studies show very positive results regarding growth in output correlated with increased penetration of communications and ICT. The studies have used macro-economic and firm-level cross country and longitudinal data. It should be noted that all such studies have important caveats – over and above those typical of statistical theory. One of the most sensitive is the contributory role of complementary investments in providing for the success of the primary investment. The range of complementary investments is broad including existing ICT diffusion, ICT skills, education systems, willingness to innovate, propensity to adopt new technologies, policies to support the creation of digital content and the general business (e-friendly) environment.

Broadband deployment is a relatively recent phenomenon (providing fewer data points) with a substantially qualitative difference from previous technologies since it allows for “networking” not just communications with significant global economic consequences.

### **(i) Recent Studies**

A study by LECG published in February 2009<sup>55</sup> specifically addressed the economic impact of broadband on real growth in GDP. The study analyzed the performance of 15 OECD countries (14 EU plus the USA) over the period 1980 to 2007. Its model regressed the dependent variable against changes in productivity, non-ICT capital stock, ICT capital stock, voice penetration and broadband penetration. It also used PC penetration as a proxy for ‘complementary investments’. The authors found “The results from our study show that broadband ... can have significant payoffs in terms of increasing productivity and economic growth. In countries like the United States, the melding of the telephone and the computer has had a wide-spread economic impact, so much so that it accounts for a significant portion (in excess of 10%) of recent productivity growth.” The results of the study are summarized below which show that for every additional broadband line per 100 population in France, French GDP would increase by US \$1,769 million and by \$8,846 million (in constant 2000 \$) for every five additional broadband connections.

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<sup>55</sup> LECG “Economic Impact of Broadband: An Empirical Study”, February 22, 2009.

Table 9: Impact on GDP for each additional broadband line per 100 persons (2000 \$US)

Country	1 additional line	5 additional lines	10 additional lines
France	1,769m	8,846m	17,692m
Finland	157m	783m	1,567m
Germany	2,023m	10,115m	20,229m
Sweden	274m	1,368m	2,736m
UK	1,845m	9,225m	18,451m
USA	11,528m	57,640m	115,280m

Source: LECG “Economic Impact of Broadband: An Empirical Study”, February 22<sup>nd</sup>, 2009

The authors also investigated the role of complementary investments through a case study of Italy and Sweden. Over the period 1980 to 1997 the rate of productivity growth in Italy exceeded that of Sweden but their positions were reversed after that period. The authors comment that “Many complex factors are at work here but it is clear that Sweden has emerged as an ICT leader whereas Italy has not”. The authors then demonstrate that Sweden out ranks Italy on most “Internet measures”, not only broadband penetration but also e-mail sending, using the internet to search for information, reading on-line newspapers, internet banking and e-commerce as a proportion of the turnover of an enterprise, all of which are indicators of complementary investments and activities. It is important for Lebanon to assess its position regarding complementary investments if it is to accrue the full potential benefits of broadband.

A study by the World Bank<sup>56</sup> in 2008 used a similar approach and a different model covering 120 countries over the period 1980 to 2006. It regressed the dependent variable average growth rate per capita against per capita GDP in 1980, average ratio of investment to GDP between 1980 and 2006, primary school enrollment in 1980 (proxy for human capital stock) and average penetration of broadband, mobile and fixed services for developing and developed countries.

The authors found that

*“The coefficient on average broadband penetration for high-income countries was positive and significant. This result suggests a robust and noticeable growth dividend from broadband access in developed countries: All else equal, a high-income economy with an average of 10 broadband subscribers per 100 people would have enjoyed a 1.21 percentage point increase in per capita GDP growth. This potential growth increase is substantial given that the average growth rate of developed economies was just 2.1 percent between 1980 and 2006. The growth benefit that broadband provides for developing countries was of similar magnitude as that for developed economies—about a 1.38 percentage point increase for each 10 percent increase in penetration.”*

<sup>56</sup> See Qiang, Christine Zhen-Wei and Rossotto, Carlo 2008, *Economic Benefits of Broadband*, and chapter 3 in *Information and Communications for Development 2009: Extending Reach and Increasing Impact*, World Bank, Washington DC.



The results of the model regarding broadband indicate that if a country is currently growing at 2% per year (in terms of GDP per capita) and it increases the penetration of broadband by 10 percentage points, then the growth rate will increase to over 3% per year – i.e. growth rates would accelerate by over 50%.

The authors' findings estimate that a low or middle-income economy with an average of 10 or more broadband subscribers for every 100 people would have enjoyed a per capita GDP growth higher by 1.38 percentage points on a recurring basis. Lebanon, for instance, had an average broadband penetration of 1.74 per 100 people during the 2000 to 2006 period. It would have enjoyed an average GDP per capita growth 1.38 percent point higher than it actually registered, had it been able to achieve a level of broadband access of 11.74% over the 2000 to 2006 period. This potential growth increase is substantial given the average long-term growth rate of Lebanon was 2.57 per cent during the period 1980-2006, that is the growth rate could have been 3.95 per cent<sup>57</sup> representing a 54% increase in GDP per capita growth rates.

Further, the authors analyzed the different contributions of fixed, mobile, internet and broadband and found that

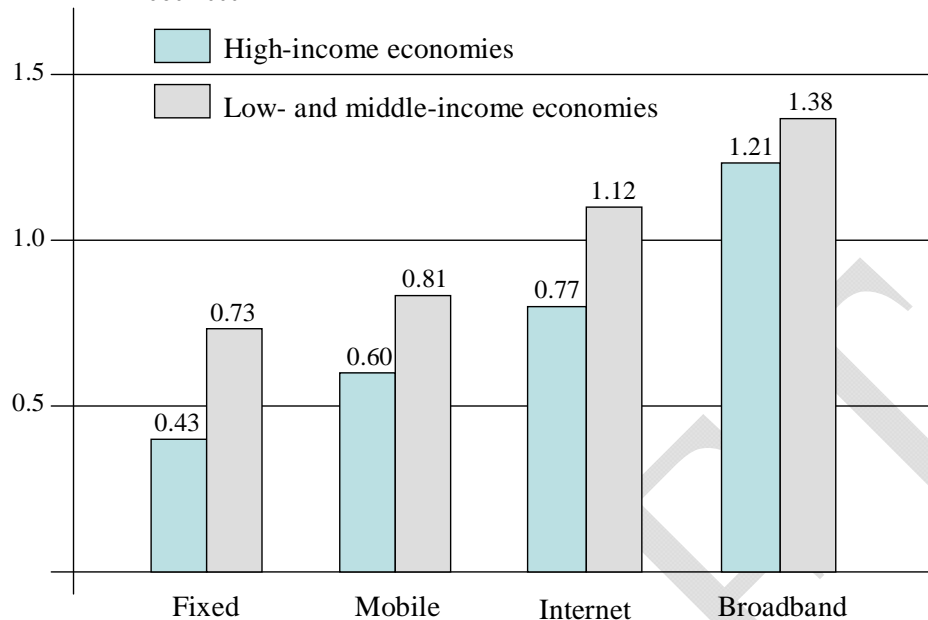
*“Despite its shorter history, broadband seems to have a higher growth impact relative to communications technologies such as fixed and mobile telephony and the Internet. Thus, current differences in broadband penetration among countries may generate significant long-run growth benefits for early adopters. Moreover, the significant and stronger growth effects of other technologies in developing countries than in developed countries suggest that the growth benefit of broadband in developing countries could be on a similar path.”*

These results are summarized in the figure below which illustrates the GDP growth flowing from a 10 percentage point increase in broadband penetration for High income and other economies.

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<sup>57</sup> This projection overlooks the impact of “external shocks”.

Figure 10: Percentage point increase in GDP per capita for every ten percentage point increase in ICT penetration, 1980-2006



Source: Qiang and Rossotto, 2008<sup>58</sup>

In 2008, the GDP of Lebanon was 43,625,691 million LBP. If in 2008 broadband penetration had risen by 10 percentage points, the point estimate of the model predicts that GDP would have increased by an extra 602,034 million LBP (equivalent to US \$400 million). Applying a range estimate of 1.2 to 1.5 percentage points the model predicts an increase in GDP of 523,508 to 654,385 million LBP (US \$348 to 435 million) on a recurring basis.

The authors implicitly provide some notion of the costs of **not** investing in the general purpose technology of broadband – the loss of significant increase in long run growth. If regional competitors do invest in broadband while Lebanon does not, then Lebanon will miss out on the associated accelerated growth rates. As the benefits of the GPT unfold in regional competitors it is conceivable that the existing long term growth rate of Lebanon may be threatened, heralding the possibility of economic stagnation or even decline.

### **(c) Potential Fiscal Contribution of Broadband**

The studies cited above predict that increases in the penetration of broadband will stimulate growth in GDP per capita above the growth rates in the absence of broadband. With all other factors held constant, particularly tax rates, the fiscal contribution of the

<sup>58</sup> All results are statistically significant at the 1 percent level except for that of broadband in developing countries which is at the 10% level.

economy will grow at the same long term rate as the economy grows – in the case of Lebanon 2.57 per cent per annum<sup>59</sup> with the point estimate. If, however, broadband penetration rates in Lebanon jump by 10 percentage points the model predicts that GDP per capita will rise to 3.97 percent per annum and by implication fiscal contributions would rise (*ceteris parabus*) by the same rate. The table below illustrates that tax revenues<sup>60</sup> and their like account for around 22.5 percent of GDP in 2008.

Table 10: Tax Revenues and GDP in Lebanon

<i>in million LBP</i>	2007	2008
Tax Revenues	5,582,892	7,182,442
<i>Tax Revenues other than customs and VAT</i>	2,332,796	3,010,956
<i>Customs Revenues*</i>	1,246,891	1,587,685
<i>Value Added Tax</i>	2,003,205	2,583,801
Non Tax Revenues	2,510,734	2,612,546
GDP	37,754,000	43,625,691
<b>Tax revenues as % of GDP</b>	<b>14.8%</b>	<b>16.5%</b>
<b>Tax and non tax revenues as % of GDP</b>	<b>21.4%</b>	<b>22.5%</b>

Source: Ministry of Finance

Based on the table above, a 10 percentage point increase in broadband penetration in Lebanon would not only raise GDP growth per capita to 3.97 percent but of the extra 1.38 percent point increase in GDP growth per capita 22.5 percent of this sum would be fiscal contributions, equivalent to 135,451 million LBP (equivalent to US \$90 million) on a recurring basis. Thus the additional growth in GDP of 1.38 percent (flowing from an increase in broadband penetration from 2 to 12 percent) would be divided between 1.07 percent for the general economy and 0.31 percent to fiscal contributions per annum. Using the range estimate of 1.2 to 1.5 percentage points growth the resultant extra yearly fiscal contribution would be between 117,789 to 147,273 million LBP (US \$78 to 98 million) on a recurring basis.

This growth in fiscal contribution, holding public expenditure steady, could be applied to the retirement of public debt or a reduction in tax rates. There are clear secondary macro-economic consequences.

Equally, the cost of **not** investing in broadband would be the foregone rates of growth of GDP and growth in fiscal contributions. Further, if as postulated, the impact of not investing in broadband is the possibility of economic stagnation or even decline the consequences for public finances could be dire. There is a risk of falling fiscal contributions<sup>61</sup> which, holding public expenditure steady, could be offset by some combination of increasing public debt, raising tax rates or extending tax the base – all of which would have wider ramifications on the macro-economy.

<sup>59</sup> In the context of progressive tax regimes where GDP growth is evenly spread, the fiscal contribution would be higher than the long term growth rate of the economy.

<sup>60</sup> Total government receipts linked to GDP are higher than tax revenues.

<sup>61</sup> In the context of progressive tax regimes where the decline in GDP is evenly spread, the fiscal contribution would be lower than the long term growth rate of the economy

The fiscal consequences of investment in broadband and the associated regulatory reform flow through the economy at different levels and time spans. A more elegant approach to assessing the fiscal impact entails identifying i) Short-term fiscal effect which are one-off income to the Government through the sale of licenses or privatization proceeds ii) Medium- and Long-term fiscal effect: where reform (in this case new broadband licenses, frequency and infrastructure use fees) stimulates sector growth; the tax base of the telecommunications sector increases (VAT, profit taxes and license fees on a higher tax base but where reform may reduce some fiscal sources (e.g. no revenue-sharing agreement; lower volume international communications; lower margins). The medium term fiscal impact is usually positive, but there may well be a temporary fiscal loss related to elasticity of demand and iii) Long-term fiscal impact where a reformed telecommunications sector is more efficient (in part through “regularization of unlicensed providers), stimulates economic growth and exports, and increases the overall tax base of the economy The sustainability of reform, however, is based on the medium- and long-term impact<sup>62</sup>. In the longer term the overall benefits of the general purpose technology of broadband spill over into the whole economy raising internal and external competitiveness and reducing exposure to economic downturns as the economy becomes more diversified. A full fiscal analysis along these lines, assessing fiscal flows, and modeling elasticity of demand, is beyond the scope of this paper

There is the immediate impact of licensing broadband operators and the fees they would pay. The next level of contribution flows from competition in the broadband market and its stimulus to sector growth which generates many forms of fiscal contributions.

Broader sector reforms related to but not reliant on broadband licensing can also be expected to generate substantial fiscal contributions. Clearly the planned introduction of private participation into the two mobile operators will produce fiscal contributions. However, the switch off of analogue broadcasting and the switch on of digital broadcasting (known as Digital Switch Over or DSO) will result in a significant “digital dividend” as spectrum previously used for analogue broadcasting is freed for other purposes.

As Ofcom noted<sup>63</sup> “The use of spectrum underpins 3% of the UK’s GDP and generates benefits worth over £40 billion a year”.

A key distinguishing characteristic of the spectrum used by analogue terrestrial TV is that it can be used to provide high bandwidth services over long distances and into buildings. This makes this spectrum particularly attractive to a wide range of service providers. If analogue TV broadcasting is switched to digital transmission, with the same

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<sup>62</sup> For a case study on Morocco and Tunisia see: <http://www.tunisiaonlinenews.com/2009/05/15/tunisia-ict-sector-contributes-10-of-countrys-gdp/>

<sup>63</sup> Ofcom (December 2007), “Digital Dividend Review: A statement on our approach to awarding the digital dividend.”

image resolution and size and number of channels, three to six times less spectrum will be needed. Digital transmission is much more efficient in spectrum usage. In the European Union this means that some 300 to 375 MHz of the current amount allocated to terrestrial broadcasting could be freed and become newly available – as “Digital Dividend”. In the US, the FCC held an auction for some of the released spectrum which ended March 2008 receiving close to \$20 billion in fees. DSO also entails analogue switch off (ASO) for the dividend to materialize.

DSO will bring additional advantages. Consumers are promised improved picture quality and a wider range of channels requiring more content and a wide range of new services including faster broadband, mobile television, high-speed mobile internet services and other spectrum-based services. All of these activities will require new investment.

DSO is a global phenomenon. Spectrum aspects of DSO are coordinated within the context of the ITU’s World Radio Conference and relevant regional bodies. The ITU has set a deadline for the completion of DSO by 2015. Different regions and countries have other deadlines e.g. 2012 in the EU and 2009 in the US. Some countries like the Netherlands, Finland, Sweden, Austria and Switzerland have already completed both DSO and ASO.

For Lebanon DSO offers the opportunity of providing a substantial stimulus to the broadband market and new opportunities related to the use of the digital dividend. The resulting fiscal contributions could be considerable.

**(d) *Indicative Capital Expenditure of 400,000  
Additional Broadband Customers***

The report has indicated that a 10 percentage point increase in broadband penetration in Lebanon using the point estimate would generate an additional \$400 million per annum in GDP on a recurring basis. This could be achieved by adding 400,000 new broadband customers. Here we address the issue of “What sum of capital expenditure (Capex) would be required to achieve the level of broadband deployment to generate the additional GDP?” Box 1 illustrates the value chain of the broadband business where the first two components, passive and active infrastructure, comprise the needed Capex. The analysis in Table 11 below tends to indicate that the Capex required would be less than the expected growth in GDP and in some circumstances, substantially less, depending on the technology used.

Crucially, the Capex sum depends on the regulatory environment. Table 11 illustrates the distribution of Capex for fixed fiber broadband networks. One source is a sample of European projects; the second is a survey by Pyramid Research and the third a project in the Gulf Region. Though the projects use different classifications,

categorizations and definitions<sup>64</sup> there are clear similarities. In two instances the cost of fiber is negligible. Civil Works plus Installation amount to between 60 and 70% of total Capex – that is digging trenches laying cables and refilling trenches are the major drivers of Capex. However, if the regulator facilitates the use of existing ducts, sewers, overhead electrical distribution systems etc these civil works are reduced by half and roll out is much quicker. Also if the regulator or other relevant body requires all new buildings to be wired inside for broadband connections, Capex for connections minimized since the final connection to the premises has already been installed.

Table 11. Capital Expenditure Distribution of Fixed Broadband Fiber Network

	Corning & ETTX Council Europe*	Pyramid Research**	Gulf Region Case Study***
Civil Works	68	65	25
Active Components	12		
Other Services	9		
Fiber Optic Cable	6		4
Installation	3		35
Hardware	2		
Network hardware, installation		10	
Customer equipment		15	
In-building cabling		10	
Access			13
Engineering & Design			7
Finance			4
Miscellaneous			12
	100	100	100

\* Source: Cisco, “The Broadband City Roadmap for Local Government Executives” 2010

\*\* Pyramid Research “Fiber in the last Mile”, 2008

\*\*\* World Bank communication 2009

For wireless broadband, the biggest Capex items are towers or radio sites. Where towers already exist and can be utilized for wireless broadband networks (e.g. GSM, broadcasting towers etc - mostly state owned in Lebanon), broadband is significantly cheaper to roll out. If the regulator can facilitate 'infrastructure sharing' - access to existing towers - Capex is minimized and again roll out can take place much more quickly due to the avoidance of site permit seeking and the reduced need for civil works construction.

These Capex considerations demonstrate the vital importance of the efforts of TRA regarding infrastructure sharing, rights of way and the use of public properties.

<sup>64</sup> In the table, active components, customer equipment and access may all refer to the same cost component

Several factors influence the sum of necessary Capex for fiber broadband networks including:

- The geological/geographical situation of the city or region (for example, rural mountain area versus metropolitan area)
- Demographics and concentration of population / businesses in given geographical areas
- The amount of dark fiber infrastructure already in the ground or the availability of a civil infrastructure that can host fiber (for example, pipes, ducts and overhead facilities used for water, gas or electricity, pipelines, railways etc.)
- The degree of existing competition in telecommunication services and the strategy of the main telecommunication provider in relation to the provision of broadband
- The availability of public or private capital for investment in broadband

All of the above vary from location to location. It is clear that providing broadband to single family dwellings in rural areas will be more expensive than supplying multi-family apartment buildings in urban areas. The following table, drawn from the experience of the International Finance Corporation (IFC), illustrates the Capex *per subscriber* for different types of networks. The table also illustrates the differences in Capex that flow from the factors listed above. For example, the sums for Broadband Wireless Access range between \$500 and \$2000 due to differences in the need for civil works, topography, population densities and types of customer served.

Table12: Broadband Networks and associated Capex

Type of network	Typical market	Advantages	Maximum data transfer rate*	Cost per subscriber
DECT (Europe) PWT (USA)**	Residential SME,, SOHO	Low costs, low energy consumption	0.5-1 Mbps	\$100 per subscriber in India, equipment only cost
GSM-CDMA	All types (assuming EDGE/EV-DO overlay)	Mobility	5Mbps	\$80-250 (towns)
Copper cable	Residential ADSL upgrade	Low cost where already installed	5Mbps	Less than \$500
Coaxial cable	Residential, TV, SOHO		a few Mbps upstream	Up to \$500
Broadband Wireless Access	SME, SOHO WiMAX	Flexibility	10-100 Mbps	\$500 to \$2000***
Satellite	Large businesses		Supplied in Mbps	\$3000 to \$4000
Optical fiber	Large businesses	Very high bandwidth	40Gbps	\$1100 to \$2900

\* Best possible speeds, in ideal conditions, with maximum technology overlay (e.g. HSPA for GSM and xDSL for copper lines)

\*\* These networks have limited market presence

\*\*\* In order to provide Gbps, dedicated point to point wireless microwave systems are required, thereby increase the cost per subscriber substantially

If it were technically feasible in Lebanon, 400,000 new broadband subscribers could be supplied over copper cable at a Capex of less than \$200 million or half of the expected growth in GDP for one year. Under optimal conditions this would be the same sum required to provide 400,000 new broadband customers using Broadband Wireless Access in Lebanon.

TRA has jointly developed with its consultants a financial model to estimate the Capex including the Radio Sites needed for the implementation of National Broadband Carrier Licenses. This *estimation* is based on various factors among which the population density, the penetration level and most importantly the rollout obligations on the licensees are crucial. Taking into account the minimum Rollout Coverage obligations (25% for suburban regions and 10% for rural regions) over a period of 5 years TRA found that the number of new sites required (without sharing of sites): was 322, with an approximate unit cost per site of \$150,000 for civil works, radio base station hardware and micro-wave link equipment, for a total of \$48.3 million in Capex – a sum which is substantially less than the forecast growth in GDP. The Rollout Coverage obligations imply that 35% of the population of Lebanon, or 1.4 million people would have access to broadband. In order to achieve 400,000 new broadband subscribers approximately 30% of those covered would have to subscribe. This implies a cost per subscriber of around \$120 per head – which places it at the lower end of the range of costs per subscriber for GSM-CDMA 3G, with a much greater bandwidth delivered for the same price.

*Box 1: Broadband Value Chain*

**Passive Infrastructure**

This is the physical infrastructure that is used to provide the broadband connectivity; it may consist of fiber optic or copper cable. It relies on assets such ducts under the streets, or sharing overhead infrastructure that dramatically reduce the cost of creating such an infrastructure (civil works)

**Active Infrastructure**

The active infrastructure consists of the electronic elements used to encode, transmit, forward, route and decode information data packets over broadband networks

**Service Offerings**

These are the services offered to customers. For residential customers they might include: high speed Internet access at 10 Mbps or faster, time-shift TV, high-definition TV, VoIP, video telephony, video on demand, gaming portals, e-government and e-health services, etc. For business customers they include: VPN services, video conferencing, Web hosting, data storage, video surveillance, etc.

**Operating Company**

This is the company that maintains and operates the active and passive network elements and sells services to customers. Depending on the business model, the operating company either sells access wholesale to other telecommunications service and content providers who serve or acts directly as a service provider to end-users.

**Telecommunications Services and Content Providers**

These are the companies (existing telecommunications service providers, cable operators, ISPs or content providers) that provide services and content to the end-user broadband customers.

**Public Sector, Residential and Business Customers**

These are the end-user customers. They potentially consist of all the businesses, residents and public sector organizations in the area served by the broadband infrastructure.



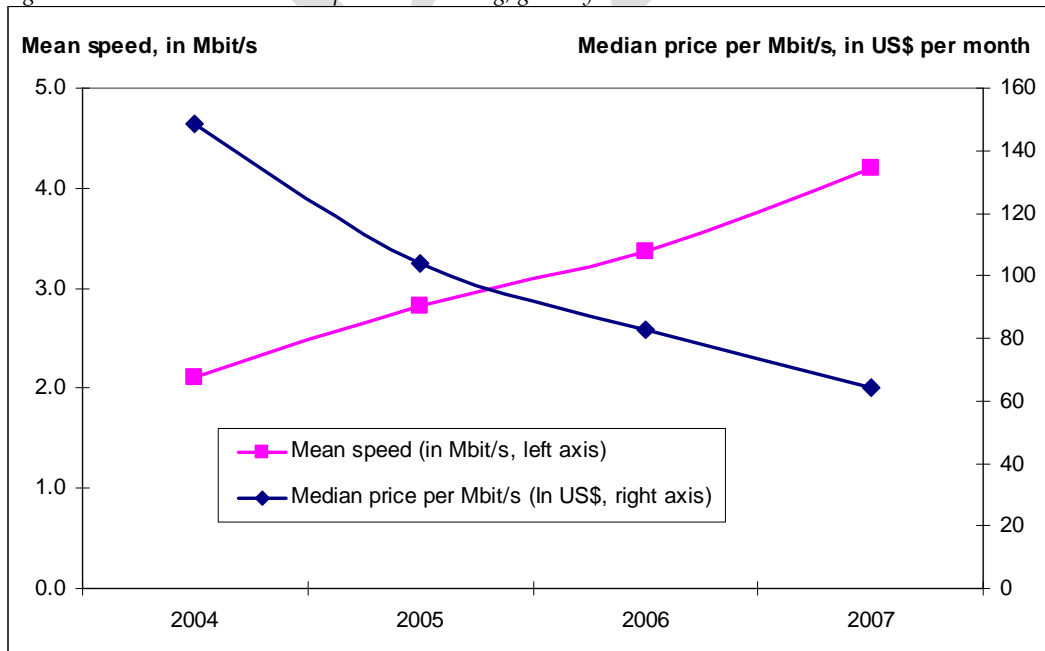
Based on this analysis we can conclude that the capital expenditure required in broadband to achieve 400,000 new subscribers – a 10 percentage point increase – is likely to be less than the extra GDP generated in one year flowing from the increase in broadband access.

**(e) Conclusion - Economic Impact Under-estimated?**

It is conceivable that these studies have under-estimated the economic and fiscal impact of investment in broadband because they have not captured the explosive growth in broadband (the rise from 300 million to 500 million subscribers between 2006 and 2008) and the side-effects of this growth. Micro-processors became ubiquitous because their price performance ratio tended to double every 12 to 15 months over a sustained period. Biggs and Kelly (2009 forthcoming) have found that between 2004 and 2007, for around 170 countries, median broadband prices, per Mbps per month fell at a compound rate of 25% per year as illustrated below. Over the same the average broadband data rate (speed) rose by 26% per year.

The combination of these trends could produce a doubling of the broadband price performance ratio over an 18 month period and if this trajectory continues (in a similar fashion to that of micro-processors) the ubiquity of broadband will be the outcome. In such circumstances all modern economies will be broadband-centric, bringing advances in economic growth and fiscal contributions. Those economies that are not broadband-centric are likely to experience serious impediments to their development. The trend also calls into question the definition of broadband - 256 Kbit/s to 512 Kbit/s as currently defined and offered in Lebanon is as clearly too low.

Figure 11: Trends in Broadband Speeds and Pricing, globally 2004 – 2007



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