

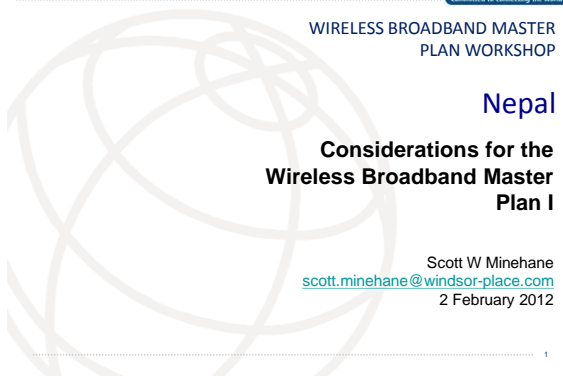


WIRELESS BROADBAND MASTER PLAN WORKSHOP

Nepal

Considerations for the Wireless Broadband Master Plan I

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The Future.

“We are at the first stage of a mobile broadband era. This fundamentally changes how people live”.

Randall Stephenson, CEO AT&T, 18 May 2011

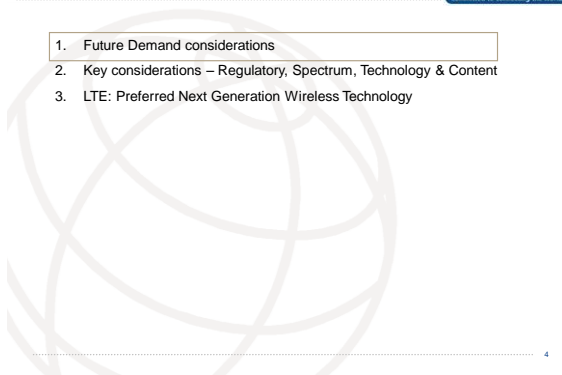


Agenda - Today's presentation

1. Future Demand considerations
2. Key considerations – Regulatory, Spectrum, Technology & Content
3. LTE: Preferred Next Generation Wireless Technology



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Overview – Market Demand



The four major factors driving market demand for wireless services in Nepal, namely:

- Continuing **growth in voice services**;
- Growth in **wireless broadband services**;
- Expected future growth in **machine to machine (“M2M”) wireless connections**; and
- The provision of **fixed broadband services** (eg xDSL, FTTH, etc) and hence wifi etc.



Mobile Services in Asia - at a glance



Mobile penetration rates of select Asian nations, 2010

Australia	101	Japan	95	South Korea	105
Bangladesh	46	Malaysia	119	Sri Lanka	83
Cambodia	58	Nepal	31	Taiwan	71
China	64	New Zealand	115	Thailand	103
Hong Kong	196	Pakistan	57	Tonga	52
India	61	Philippines	86	Vietnam	175
Indonesia	92	Singapore	145		

ITU: 2011 Statistics

- These figures show that Nepal **does not** currently possess a developed mobile services sector.
- **It is necessary for mobile penetration itself to improve in order to facilitate wireless broadband** in the Nepal market.



Growth in Wireless Broadband Services



Based on global statistics the number of wireless broadband subscribers have exceeded the number of fixed broadband subscribers and will continue on an explosive growth path based on current growth estimates.

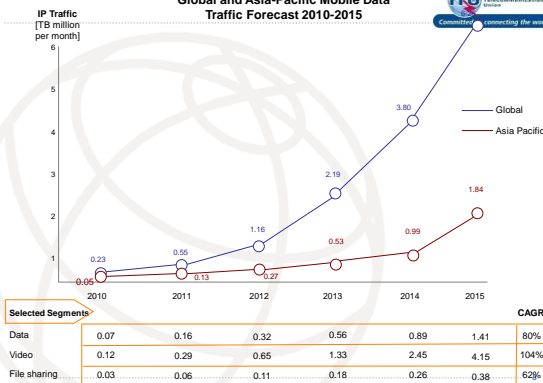
As mobile broadband becomes 'personal broadband' and smart phones such as Apple's iPhone proliferate, a leading industry commentator has assessed that the potential for mobile broadband in many markets is very high.

The growth of broadband wireless makes for a very different future for cellular mobile operators (and indeed handset manufacturers) in a spectrum sense.

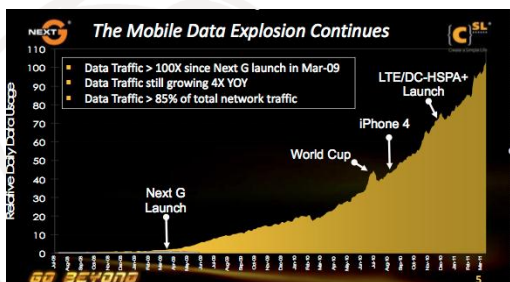
- Rather than operating on the single global frequency originally endorsed for 3G and indeed earlier for GSM, operators will typically provide services over 3 or more spectrum bands.

7

Global and Asia-Pacific Mobile Data Traffic Forecast 2010-2015



Mobile Data Explosion in Hong Kong



9

Mobile Traffic Forecasts



A recent report by the UMTS Forum Report 44 forecasts that a typical European per user daily consumption of 155Mb for mobile broadband and 265 Mb for dongle use by 2015. We are trying to formulate Nepalese estimates

Mobile traffic forecasts 2010-20 in this Report

Total daily mobile traffic per subscription
 In 2010, daily traffic per Mobile Broadband subscription in the representative Western European country will stand at 294 MB as an average and at 503 MB for dongles only.
 Finally, we anticipate total worldwide mobile traffic of 351 EB in 2025 representing a 174% increase compared to 2010.

Daily mobile traffic per subscription	2010	2015	2020
Mobile Broadband (MB per day)	10	155	294
Dongles (MB per day)	26.7	265	503

According to the model used in this report, users of Mobile Broadband (MB) subscriptions with high-end smartphones and dongles will represent 31% of the subscriptions in 2020 and 63% of the mobile traffic.



10

Machine To Machine Services



According to industry commentators there were 61 million M2M device connections globally at the end of 2010.

- M2M market is forecast to grow by 40-50 percent per annum with an estimated 2.15 billion wireless/fixed connections by 2020.
- Over 90 percent of forecast connections will utilise wireless

The growth in the number of M2M connections is likely to be most pronounced in the developed markets through 2015 and then in emerging markets in the period 2015 to 2020.

For future network planning, while many M2M applications are not intensive data users, a growing number of such applications if they involve data and video are. E.g. live video feed from first responders (e.g. Fire, Police and Ambulance) can total up to 10 Gb per month per service.

Industry Sector	M2M device connections	Market Share
Utilities	1.32	62%
Security	0.45	21%
Automotive and transport	0.28	13%
Healthcare	0.07	3%
Government, retail & financial services	0.03	1%
Total	2.15	100%

Source: Analysys Mason, Machine to machine device connections: Worldwide Forecast 2010-2020

11

Fixed broadband competition in Nepal



The table to the right shows that the market for fixed line services in Nepal is marginal

Services	Telecommunications service penetration and growth rates 2009-2010			
	2009	2010	% population	% growth
Fixed telephone	618526	641698	3%	3%
Mobile telephone	6288942	9199562	31%	46%
Other telephony	240841	404,206	2%	150%
Data/Internet	703,762	1,902,761	6%	170%

Source: NTA

This may aid in the implementation of the WBB Masterplan because:

- Reduced consideration is necessary towards the consequences for legacy fixed line networks, except as regards to backhaul infrastructure.
- There are significant drivers of demand in the market for wireless services.

12



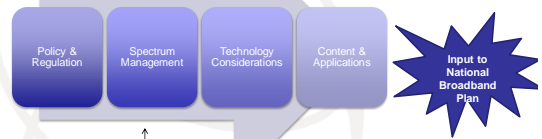
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13

Key Wireless Broadband Masterplan Considerations



Our initial focus areas



Focus of 2nd Session lead by Rajesh

14

Regulatory and Policy Aspects



Key factors:

- Assessment of existing Policy and Regulatory frameworks
- Enabling optimal regulatory environment
- Capacity building
- Defining and Separating policy, regulatory and operational roles
- Promoting competition from new entrants
- Embracing Modernization
- Infrastructure development
- Interconnection and access
- Stimulating user demand and enabling communities
- Implementation issues

15

Content and Applications Aspects



Key factors:

- Creating a conducive environment for the uptake of content & applications
- Government (e-health, e-education)
- Private (e-commerce/banking and mobile payments)
- Further investment in the sector

16



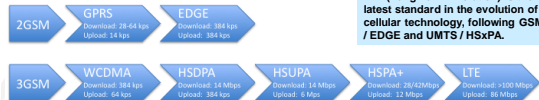
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17

LTE: The Preferred Next Generation Wireless Technology



Evolution of Cellular Technologies



LTE (Long Term Evolution) is the latest standard in the evolution of cellular technology, following GSM / EDGE and UMTS / HSPA.

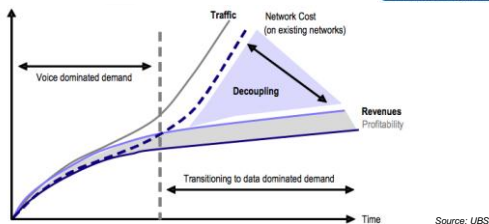
Frequency Spectrum for IMT2000/4G/LTE

Spectrum Frequency	Bandwidth	Keputusan ITU
450-470 MHz	20 MHz	WRC-07
698-806 MHz (ITU Region 3)	108 MHz	WRC-07
825-850 MHz	154 MHz	WRC-2000
1710-1885 MHz	175 MHz	WRC-2000
1885-2025 MHz	140 MHz	WARC-92
2110-2200 MHz	90 MHz	WARC-92
2300-2400 MHz	100 MHz	WRC-07
2500-2690 MHz	190 MHz	WRC-2000
3400-3600 MHz	200 MHz	WRC-07

- LTE is optimal migration choice for both GSM & CDMA operators providing additional capacity & high speed wireless broadband in a spectrum efficient manner.
- LTE is a global standard that will help ensure affordable prices for CPE for consumers.
- LTE is very flexible can be used in different spectrum bands with bandwidths ranging from 1.4, 2.5, 5, 10 & 20 MHz using both FDD and TDD.
- LTE supports full IP-based network, has been harmonized with other radio access technology, and will soon be endorsed as a 4G technology by the ITU.

18

Benefits of LTE: Decoupling Revenue and Traffic



Source: UBS

LTE – which is designed for data - is needed by operators to handle the massive increase in data capacity requirements for wireless broadband services.

Providing this capacity needs to be cost efficient as wireless data services are not priced on a time basis (ie per minute) like cellular voice services. As such growth in wireless data/broadband will not be result in proportional increases in revenues for mobile operators.

19

Support by Global Operators for LTE deployment

A review of 15 global operators finds high degree of support for LTE deployment.

Most common used band for LTE is 2.6 GHz.

Second most common is 700/ 800 MHz band - for countries that have undertaken the switchover to digital TV and already secured the digital dividend.

Other spectrum bands like 2.3 GHz (TDD) and 1800 MHz band is being used/considered.

For countries that have not secured the 700/800 MHz digital dividend, there is pressure to do so as soon as possible.

Global LTE deployment is taking place very quickly in both developed and emerging markets, with many operators implementing large-scale deployment of LTE while others are involved in ongoing trials.

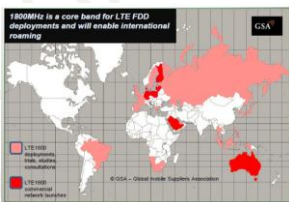
Currently, WIMAX operators – in countries like the US - are moving to deploy LTE as well.



20

Overall LTE and LTE 1800 Deployment

- 285 operators are investing in LTE in 93 countries
- 226 operator commitments in 76 countries 59 pre-commitment trials in 17 more countries
- 49 commercial networks in 29 countries
- GSA forecasts 119 commercial LTE networks in 53 countries by end 2012



Source: GSA, Embracing the 1800MHz opportunity: Driving mobile forward with LTE in the 1800MHz band, 25 November 2011

21

Case Study: Telstra's LTE 1800 Deployment

In 2010, Telstra conducted the first LTE 1800 trial in Australia which evaluated many features and capabilities such as throughput, coverage, handover, interference mitigation, latency and jitter.

The trial showed that LTE 1800 MHz technology is ready for commercial launch with download speeds up to 149.4 Mbps being achieved in lab environment. Telstra also conducted an HSPA+ and LTE coverage and capacity study for Melbourne using Forsk's Atoll RF stimulation tool.

Telstra has announced that it will deploy a commercial LTE 1800 MHz network in 2011. Evolution to an integrated HSPA+LTE network is a logical extension of this strategy. Telstra's move to LTE is being driven by optimisation of demand management and investment.

Telstra considers that their LTE network rollout will focus on:

- maintaining user experience in terms of coverage and speed;
- leveraging common network capabilities & products across the packet core; and
- penetration of Dual Mode LTE/HSPA capable devices (ie focusing on highest demand first).

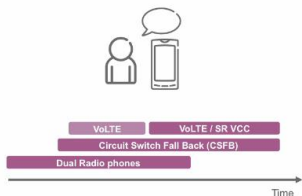
Source: Telstra, (Mike Wright), Building the Mobile Broadband Ecosystem for LTE in 1800MHz, GSMA Mobile World Congress 2011, Barcelona, February 2011

22

Addressing Voice on LTE

LTE cannot be used in a 'green-field' network deployment in the absence of its ability to provide highly profitable voice services. Voice over LTE is scheduled to be available in 2012. In the interim, there are fall-back techniques for voice calls to existing GSM networks

TELEPHONY IN LTE



Source: Informa Telecoms & Media and Ericsson, LTE Early Launch Strategies: Who and Why? Webinar, 21 June 2011

23

One other thing (with apologies to the late Steve Jobs)

- 40 commercial UMTS900 networks (HSPA or HSPA+ commercial services launched in 900 MHz spectrum)



As at 29 January 2012, at least 25 countries with UMTS900 deployments including Australia, Bulgaria, Croatia, Estonia, Faroe Islands, Finland, France, Germany, Ghana, Greenland, Hong Kong, Iceland, Latvia, New Zealand, Poland, Qatar, Romania, Russia, Slovenia, South Africa, Spain, Switzerland, United Kingdom, Ukraine and Venezuela.

Nepal should be added to this list asap !

24

