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Background Paper on Access and Infrastructure

1. BACKGROUND

The principal objective of the "Connect Arab" Summit is to take stock of the existing situation in the region and redouble efforts to achieve the connectivity targets set by the World Summit on the Information Society (WSIS)[1] in 2003 and 2005. These targets are geared to achieving the United Nation's Millennium Development Goals[2] by 2015.

The Connect Arab Summit takes place in the context of increasing recognition that broadband networks capable of carrying greater quantities of data at higher speeds can fundamentally transform the social and economic fabric of a nation – for the better. The Broadband Commission for Digital Development concluded that broadband connection to the Internet is a central element of modern society, with wide economic and social benefits. In every nation irrespective of the state of development, these networks form the core of national infrastructure together with road, rail and electricity networks. Broadband networks can carry data and services that can significantly transform education, enterprise, health care and delivery of government services.

2. PURPOSE OF THIS PAPER

The purpose of this background paper is to foster investment in enhanced connectivity in the Arab Region to support economic growth, employment and development.
It highlights the current situation and proposes a possible future course of action. The objective is to facilitate discussion on the next steps that should be taken to improve connectivity. In particular, it will focus first on ways to complement and extend the existing access networks to ensure availability of broadband connectivity, including rural and remote areas; and secondly on attracting investment in ICT infrastructure and ensuring the sustainability of the backbone and access networks. For a broadband-enabled economy to emerge, it is crucial that necessary workforce skills are built across the society. Central to the success of these strategies is the issue of affordability of ICT services.

This paper is divided into three parts. PART A addresses the state of the telecommunication infrastructure in the region, taking into account adoption of new technologies, provision of new services and the regulatory and policy environment which has provided an impetus to such developments (or could help accelerate this process).

PART B provides an overview of the advantages of the transition from analogue to digital terrestrial broadcasting, the challenges that will be encountered, the factors that need to be considered in preparing a

[1] World Summit on the Information Society: http://www.itu.int/wsis/index.html
[2] United Nation's Millennium Development Goals: http://www.un.org/millenniumgoals/

roadmap for the transition as well as using the transition as an opportunity to promote accessible television for persons with disabilities and the role of spectrum management in infrastructure development.

PART C focuses on infrastructure of a different kind – a nation's human capital – and leveraging the investment in broadband infrastructure to develop in the Arab region a competitive, broadband-enabled, knowledge-based economy and the social and economic development of persons with disabilities and women.

PART A

BUILDING A SUSTAINABLE BROADBAND ECOSYSTEM

1. CURRENT STATUS OF BROADBAND ECOSYSTEM IN THE ARAB REGION

The last decade has seen a remarkable spurt of growth in several Arab countries. There have been significant changes in the regulatory and policy area which has seen the emergence of competitive markets, increased penetration of telecommunications, greater usage of Internet and generally lowering tariffs. These developments have coincided with greater investment in education and institution building (detailed in Section B). Suffice it to say that according to the World Economic Forum's Global Information Technology Report (GITR 2009-2010) and again in their Global Competitiveness Report of 2010-2011, seven Arab nations ranked among the top 50 nations worldwide as compared to only one (Tunisia) in 2002. Four Arab countries were signaled out – Bahrain, the United Arab Emirates, Qatar and Kuwait – as being most ready to utilize ICT for the creation of knowledge-based economies or knowledge economies/societies. In the ITU ICT Development Index (IDI) 2010, the top ranked countries in the region are the UAE, Qatar, Bahrain and Saudi Arabia, all featuring among the top 50 economies worldwide. Three countries from the region (Morocco, Oman and Saudi Arabia) are among the most dynamic countries worldwide in terms of IDI improvements between 2008 and 2010, and they registered the highest rank increase among the countries in the Arab region.
In the telecommunication sector the last few years have seen increasing investments in ICT infrastructure in the Arab region. The bulk of this investment has been on improving mobile infrastructure and access. However, high-speed internet services which are so important for key business, government and consumer applications continue to be either expensive (particularly in relation to average local incomes) or unavailable in rural and remote areas (depending on location).

WiMAX has been commercially available for several years in Algeria, Bahrain, Jordan, Kuwait, Lebanon, Saudi Arabia and Tunisia. WiMAX service was introduced in Oman and Yemen during 2010. Yet, by end of 2011, around one third of the countries in the Arab Region had not yet launched WiMAX services. The service was not available in Egypt, the Palestinian Authority, Sudan (excluding South Sudan) and Syria by end of 2011. The WiMAX service in Qatar stopped in July 2011.

In several of these countries, WiMAX services have proved very effective competition to established ADSL based services. LTE is also being adopted in the region - operators in Saudi Arabia and the United Arab Emirates (UAE) are offering this technology. These developments, together with the wider availability of smart phones have contributed to the uptake of broadband services.

Since 2008, there has been a general drop in the prices of fixed broadband services in developing countries. The fall in prices has been less steep in the Arab region. And tariffs continue to remain expensive in this region. (For an extensive discussion see ITU, Measuring the Information Society, 2011.)

The number of Internet users is continuing to rise, especially with the introduction of technologies that overcome poor ICT infrastructure that hinders Internet access in the region. A major development in terms of broadband is the increasing availability and data rates of 3G mobile-broadband networks and services. This development puts pressure on the fixed broadband operators. Mobile-broadband markets

are growing rapidly in many countries in the region, Lebanon, for example, has recently launched 3G+ services.
There is much debate over the effects of broadband networks, both wired and wireless, on the national economy. The recent developments across the Arab region have led to unprecedented gains both in terms of increased productivity and growth of GDP. A recent ITU study3 showed that the impact of broadband penetration growth of 10 percent, in the growth of the per capita GDP is between 0.18 percent and 0.21 percent. Broadband has thus had a substantial contribution to GDP growth in the Arab region, ranging from 6 percent of total GDP growth for Bahrain between 2003 and 2010 to 0.58% between 2005 and 2010 for Libya. This finding confirms the rule of "return to scale" where the contribution of broadband to GDP per capita growth increases with penetration. From a policy standpoint, governments need to fast-forward the deployment of broadband if they want to maximize its economic impact.

The convergence of Internet and mobile cellular services over shared platforms facilitated by the rapid take up of smartphones and mobile broadband devices coupled with the deployment of fixed and wireless next generation (NGN) technologies are expected to reshape the present structure of communication systems and access to the Internet Continued convergence within the ICT sector has presented organizations and regulators around the world with new challenges associated with vertical and horizontal integration of on-line services and applications. Technological innovation, stimulated through digitalization, has been a major factor in driving change.

The growing force of convergence has resulted in a growing trend towards creating regulators equipped to regulate a competitive and converged market and better suited to respond to new technologies and the interdependency of different communications services. Some countries have created converged regulators dealing with various aspects such as telecommunications, broadcasting and the information society (e.g.: United Kingdom, South Africa, Malaysia). Others have created converged carriage regulators (e.g.: Singapore). Some countries have taken a different approach by including the regulation of the telecommunications sector in the mandate of a multi-sector regulator (e.g.: Lithuania, Germany, Gambia, Rwanda).

Better coverage and introduction of high speed data rate : The intention in presenting this paper is to develop consensus among various stakeholders on approaches for mobilizing resources for accelerated investment in order to achieve the following:

1. Complementing and extending the existing access networks to ensure connectivity in rural and remote areas, through wired or wireless communication systems; and
2. Fostering development of an enabling environment aimed at attracting investment in ICT infrastructure, encouraging public-private partnership, harmonizing policies and regulatory frameworks, as well as building human capacity for maintaining and ensuring the sustainability of established backbone and access networks.

2. SUMMARY OF EXISTING SITUATION

Fixed line sector: The fixed telephone line penetration in the Arab Region has stagnated at around 10 percent over the last five years. The difference in main fixed line infrastructure between urban and rural areas in the many countries is significant and for most countries, the large majority of fixed telephone lines are deployed in urban areas.

[3] ITU, The impact of broadband on the economy, January 2012, to be published by mid of February 2012 www.itu.int/broadband

Mobile sector: The Arab Region mobile penetration has grown quickly in recent years. Mobile penetration in the region will have grown from 27 percent in 2005 to an estimated 97 per cent by end 2011. The high growth can be attributed to relatively increased competition in the mobile market (13 countries). Countries which at the end of 2010 had less than 60 per cent mobile cellular penetration were Comoros, Djibouti, Somalia, Sudan and Yemen. UAE, Saudi Arabia, Kuwait, Oman, Qatar, Morocco, and Bahrain have more than 60 mobile broadband subscriptions per 100 inhabitants.

The region has also been in the forefront of adopting new technologies. Yet seven out of 21 countries in the region have not launched 3G by end of 2010. During the year 2011, there have been several 3G deployments in the Arab Region. These network rollouts include the deployment of 3G by Lebanon's two mobile cellular providers, Zain in Jordan and Tunisie Telecom in Tunisia. However, 3G services have not been deployed yet in Algeria nor in the Palestinian Authority despite awarding the 3G license to the telecom operator Wataniya. Yemen Mobile in Yemen offers 3G services over EV-DO Rev-A technology only in three locations in Yemen (Aden, Al- Amanah and Huqoul Al-Nift). Although 3G seems to be operational in Iraq, the only 3G operator is restricted to the Kurdistan region. Thus, the majority of Iraqis are deprived from 3G services.

On the other hand a number of mobile operators in the region have adopted or on the verge of adopting LTE. By the end of 2011, LTE services were deployed in three Arab countries; Saudi Arabia, the UAE and Kuwait. The service is commercially offered in Saudi Arabia by the three GSM market players; STC, Mobily and Zain Saudi Arabia. On September 13, 2011, Mobily announced the operational launch of Time Division Long Term Evolution (TD-LTE (4G)) in certain areas in Saudi Arabia. One day later, Zain Saudi Arabia and STC announced the launch of their LTE services.

As for the UAE, Etisalat has completed the deployment of its LTE network in the country. Etisalat UAE has launched its LTE network in September 25, 2011. The service was commercially launched in the market during December 2011. For its part, the second operator in the UAE market, du, announced on May 24, 2011 the completion of LTE pilot. However, by end of 2011, the operator had still not launched LTE services commercially.

In December 2011, Viva Kuwait commercially launched Kuwait's first LTE network. The service currently covers selected central areas in Kuwait, and will expand in the future to cover all areas. As for the other two players in the Kuwaiti cellular market; Zain and Wataniya, the two operators announced that they are in the process of developing their LTE networks. Zain announced in July 2010 that it commenced the test transmission of LTE, while Wataniya held demonstrations of the technology in January and February 2011.

A key issue here is the availability of spectrum at a national level in bands that have been allocated to it by international agreement. Several countries in the region face the issue of legacy uses of such bands.

Internet sector: The average estimated end 2011 Internet penetration rate of the Arab Region is 29 percent. This figure lies somewhat below the estimated 2011 world average of 35 percent. An increasing number of Internet users are enjoying services via a mobile connection (See Table1).

Broadband: ITU's end 2011 estimates suggest that fixed broadband penetration in the Arab States, at 2.2 percent, remained relatively low, and below both the world and developing country average of 8.5 and 4.8 per 100 inhabitants, respectively. In some countries, including in Djibouti, Mauritania, Syria and Yemen, it remained negligible. By end 2010, the leading fixed broadband countries in the region were, in terms of penetration in relation to inhabitants, UAE (10%), Saudi Arabia (5%), Qatar (9%) and Bahrain (12%). While these may be relatively low in comparison with countries with equivalent income in Europe and North America, it is important to note that they are very respectable levels in terms of penetration per household, given the relatively large size of households in the Region. In Bahrain for example, fixed broadband penetration in terms of households is 85%, and is greater than fixed telephony penetration at 83% (Source: TRA, 2009)

In the recent past, 3G mobile services have been introduced in most countries across the world. In the Arab Region, about one third of the countries had not yet launched 3G mobile broadband services by end 2010 and ITU estimates that by the end of 2011, the region will have a mobile broadband penetration of 13 percent, which compares to an estimated 17 percent globally and 8.5 percent for developing countries.

All of the 3G/3.5G cellular operators in the Arab countries provide mobile Internet services, and most operators provide local video calling services. Many of these operators also provide mobile TV services.

Table 1: ICT penetration rates by region, end 2011 estimates

	Fixed telephone lines per 100 inhabitants	Mobile Cellular suscriptions per 100 inhabitants	Internet users per 100 inhabitants	Fixed Broadband subscriptions per 100 inhabitants
Arab States	9.7	96.7	29.1	2.2
Africa	1.4	53	12.8	0.2
Americas	28.5	103.3	56.3	15.5
CIS	26.3	143.0	47.6	9.6
Asia & Pacific	13.0	73.9	27.2	6.2
Europe	39.1	119.5	74.4	25.8
World	16.6	86.7	34.7	8.5

Source: ITU (http://web.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom.html)

Backbone: As a result of the exponential growth of the mobile sector, a solid backbone infrastructure has come into being in some countries. Apart from the backhaul network of the fixed line operator, mobile operators have set up their own network to transport traffic, as a quick means of expanding their subscriber base in different parts of the country. In some countries the backbone is sporadic and mobile signal patchy The majority of the telecommunication operators in the Arab Region are fully backboned by fiber optics, microwave radio relay networks and submarine cable links. In addition to these technologies, the international traffic is carried by satellite in some countries, such as Lebanon. In several cases, these backbones are connected by gateways with neighboring countries. For example, the fixed network infrastructure in Iraq is connected by several gateways with all Iraq's neighboring countries in addition to the Gulf, despite having a lack of fiber-optic backbone infrastructure in the country; whereas UAE is connected with nearby countries through global and submarine cables.

With regard to capacity, Algérie Télécom has a National Backbone Transmission capacity of 2.5 GB / s to 80 GB / s.; whereas Algérie Télécom Mobilis network's IP/MPLS based backbone has a switching capacity of 320 Gigapackets per second.

There are several ongoing initiatives in the Arab Region to expand and upgrade the backbone infrastructure, in addition to increasing the bandwidth. Recently, Syrian Telecom commissioned two new STM-16 links at the beginning of 2011. This increased Syria's International bandwidth to 10,695 Mbps by June 2011. Bandwidth per Internet account increased from 5.21 Kbps by end of 2010 to 9.72 Kbps by June 2011. More links are to be installed over the next two years.

In July 2011, du announced the completion of the first phase of its Optical Transport Network (OTN) expansion along with its own Backbone Infrastructure. du has invested over US$ 65 million in this project, which will be completed by mid-2012. The project is built on a Fiber Optic Cables Infrastructure Backbone of around 1,100 km all over UAE.

Intraregional connectivity:
Internet Exchange Points: Given the need to keep intraregional traffic within the region and for efficient use of international bandwidth, efforts have been afoot for establishing IEXs.

By end of 2011, six countries in the Arab Region had Internet Exchange Points (IXPs). The Palestinian Authority announced its intention to launch an Internet Exchange Point in 2011.

Emirates Internet Exchange (EMIX) was established in 1998. EMIX, which is a division within Etisalat, constitutes the first Network Access Point (NAP) in the Middle East, offering IP transit connectivity to ISPs in the region. The Network is connected across the globe via fiber-optic links to Europe, the Far East and the United States through SEA-ME-WE-3, SEA-ME-WE-4 and FLAG cables.

There are two IXPs in Bahrain. The Bahrain Internet Exchange (BIX) which was established on August 13, 2003 by Decree (47) of 2003. BIX had entered an agreement with Tata Communications to develop a regional high-bandwidth subsea fiber optic cable which links the Kingdom of Bahrain and other Gulf Countries to India and the rest of the world via Tata's Global Network (TGN). The second IXP is the Gulf-IX (GIX), which was established in April 2009. The first Internet Exchange Point in Lebanon, namely, Beirut-IX (BIX), was launched in December 2007.

Egypt has two Internet exchange points: Cairo Internet Exchange Point (CAIX) and Middle East Internet Exchange (MEIX). CAIX was established in May 2002 by the MCIT. CAIX mission is to connect all Class A and B ISPs in Egypt to exchange the local traffic inside Egypt and save their international bandwidth. Cairo Middle East Internet Exchange (MEIX) facility began operation in July 2007.

Sudan Internet Exchange Point (SIXP) was officially launched on November 27, 2011. The current members of SIXP are: Sudatel, Canar, Zain, MTN, Vision Valley, & Sudanese Universities Information Network (SUIN).

In April 2011, the Palestinian Authority started planning for establishing the “Palestine Internet Exchange” (PIX). ISPC.ps, the owner of PIX, is moving towards purchasing, installing and operating the required setup to start a pilot phase of the exchange. The project activities include setting up the exchange point switch, registering peers and carrying out knowledge dissemination among network administrators.

Submarine Cables: All Arab Countries are connected via submarine cables, with the exception of the Palestinian Authority. The number of launched and planned submarine cables in the Arab Region exceeded 40 by the end of 2011. Major submarine cables already deployed in the region include FLAG Europe-Asia (FEA), Fiber Optic Gulf (FOG), SeaMeWe-3, SeaMeWe-4, FLAG FALCON and SEACOM/Tata TGN-Eurasia.

Submarine cables that have recently launched their commercial operations include the India-Middle East-Western Europe (I-ME-WE) cable. The 13,000-kilometre submarine communications cable system was founded by 9 companies, which are: Telecom Italia Sparkle, Etisalat, Tata Communications, Pakistan Telecommunications Company Ltd., France Telecom, Airtel (Bharti), Saudi Telecom, Ogero, Telecom Egypt. The I-ME-WE cable system comprises three optical fibre cable pairs and 2 trunk lines. The design capacity is 3.84 Terabits per second. It has cable landing stations in Egypt (Alexandria, Suez), France (Marseille), India (Mumbai), Italy (Catania), Lebanon (Tripoli), Pakistan (Karachi), Saudi Arabia (Jeddah) and the United Arab Emirates (Fujairah).

Another major recently launched project in 2010 is the Eastern Africa Submarine System (EASSy). The 10,500km submarine cable system was deployed along the east and south coast of Africa. It links South Africa with Sudan via landing points in Mozambique, Madagascar, the Comoros, Tanzania, Kenya, Somalia and Djibouti. EASSy has a capacity system of 4.72 Terabits per second with 2 fibre-pair configuration. It is the first to deliver direct connectivity between eastern Africa and Europe / North America. EASSy

interconnects with multiple international submarine cable networks in Europe, the Americas, the Middle East and Asia.

The Gulf Bridge International Cable System (GBI) is the Middle East's first privately owned submarine cable system. The cable has a capacity of at least 5.18 Terabits per second. On December 20, 2011, the completion of works of the GBI cable system segments within the Gulf, the Gulf to India, the Gulf to Egypt, across Egypt and across the Mediterranean to Italy was announced. The cable has landing stations in Bahrain (Al Hidd), India (Mumbai), Iran (Bushehr), Iraq (Al-Faw), Kuwait (Kuwait City), Oman (Al Seeb), Qatar (Al Daayen), Saudi Arabia (Al Khobar) and the United Arab Emirates (Fujairah).

Telecom Egypt's TE North Cable was put in service in 2011. The cable, spanning 3,634km, connects Abu Talat in Egypt to Marseille in France and provides access areas to Cyprus and other parts of the Mediterranean.

The new Europe-India Gateway (EIG) cable system was commercially launched in 2011. EIG stretches from Mumbai in India to the UK, with landing stations in UAE, Oman, Saudi Arabia, Djibouti, Egypt, Libya, Monaco and Marseilles, Gibraltar, Portugal and the UK. The 15,000 Km cable has received investment of around US$ 700 million and has a capacity of 3.84 Terabits per second. The EIG Consortium members are: AT&T, Bharti airtel, BT, Bharat Sanchar Nigam, Cable&Wireless Worldwide, Djibouti Telecom, du, Gibtelecom, Libyan Post, Telecom and Information Technology Company, MTN Group, Omantel , PT Comunicates, S.A., Saudi Telecom Company , Telecom Egypt, Telkom SA and Verizon.

Work on the TGN-Gulf cable began during October 2009. The project was completed in 2011. The TGN-Gulf cable acts as a gateway to the TGN network. Tata Communications' partners in the TGN-Gulf project, namely Bahrain Internet Exchange in the Kingdom of Bahrain, Nawras of Oman, Qatar Telecom of Qatar, Mobily of the Kingdom of Saudi Arabia and Etisalat of the United Arab Emirates are exclusive landing parties for the 4,469 km TGN-Gulf Cable System as well as service delivery partners.

The FLAG Hawk submarine cable has landing stations in Egypt (Alexandria), Cyprus (Anatoliko) and France (Marseille). The 3,700 km submarine cable has an initial bandwidth of 100 Gbps, and a maximum of 2.56 Terabits per second.

MENA (Middle East and North Africa) Submarine Cable System (MENA-SCS) is a subsidiary of Orascom Telecom Holding (OTH). The cable is expected to be launched during the first quarter of 2012. The 9,030km cable (including 930km terrestrial fiber cable) spans three continents (Europe, Africa and Asia), initially six countries (Italy, Egypt, Saudi Arabia, Oman and in conjunction with TW1, OTH cable to UAE and Pakistan), potentially five countries (Greece, Eastern of Mediterranean Sea, Sudan, Djibouti and Mumbai), two seas (Med Sea and Red Sea) and one ocean (Indian Ocean). The cable has an ultimate capacity of 5.76 Terabits per second.

The Construction and Maintenance Agreement (C&MA) of the Africa Coast to Europe (ACE) submarine cable project was signed on June 5, 2010. The nineteen signatories to the C&MA are Baharicom Development Company, Cable Consortium of Liberia, Companhia Santomense de Telecomunicações, Côte d'Ivoire Telecom, Expresso Telecom Group, France Telecom, Gambia Telecommunications Company, International Mauritania Telecom, Office Congolais des Postes et Télécommunications, Orange Cameroun, Orange Guinée, Orange Mali, Orange Niger, PT Comunicações, Republic of Equatorial Guinea, Republic of Gabon, Sierra Leone Cable Company, Sonatel and Sotelgui.

The 17,000 km-long fiber optic cable will stretch from France to South Africa, and will have an overall potential capacity of 5.12 Terabits per second. The system will also support the new 40 Gbps technology. The project is expected to be operational in the first half of 2012. It will connect 23 countries, either directly for coastal countries or indirectly through terrestrial links for landlocked countries Mali and Niger.

The Africa Coast to Europe cable will be the first international submarine cable to land in Democratic Republic of Congo, Equatorial Guinea, The Gambia, Guinea, Liberia, Mauritania, Namibia, Sao Tome and Principe and Sierra Leone. Other countries benefiting from the ACE project include Angola, Benin, Cameroon, Côte d'Ivoire, France, Gabon, Ghana, Mali, Niger, Nigeria, Portugal, Senegal, South Africa and Spain (Tenerife). ACE will complement existing submarine cables, such as SAT-3/WASC/SAFE, SEA-ME-WE.3 and ATLANTIS 2.

Terrestrial Cables: In 2010, two major terrestrial fiber cable projects were announced in the Arab Region. The Regional Cable Network (RCN) is a Regional high capacity redundant Dense Wave Division Multiplexing (DWDM) terrestrial cable network project. The RCN will run for 7,750 km (round trip route). It will extend from the city of Fujairah (UAE) to Istanbul (Turkey) passing through Riyadh (Saudi Arabia), Amman (Jordan) and Tartous (Syria) before entering the Turkish territory. From Istanbul this cable will be extended also to Europe, where 15 access points located along the Bulgarian and Greek borders with Turkey are already available. The communications cable will be the longest fully-redundant terrestrial communications infrastructure in the Middle East, and will be capable of covering the entire Gulf region.

The RCN cable will have a 12.8 Terabits per second data carrying capacity. The project will guarantee that every site along the cable path will always be accessible no matter if a network's service is intermittent or interrupted.

The telecom operators who signed for the RCN project are: Etisalat (UAE), Mobily (Saudi Arabia), Jordan Telecom/Orange (Jordan), Mada and Zain's partnership (Jordan), the Syrian Telecommunications Establishment (STE, Syria), and a Turkcell's subsidiary, Superonline (Turkey).

The RCN cable is competing against another Middle Eastern new fiber-optic project: the JADI Link. This network will be connecting Jeddah (Saudi Arabia), Amman (Jordan), Damascus (Syria) and Istanbul (Turkey). The JADI Project is the result of the collaboration between Turk Telecom (Turkey), Saudi Telecom Company (STC, Saudi Arabia), Jordan Telecom (Jordan) and the Syrian Telecommunications Establishment (Syria). The 2,530 km cable is aimed to be an alternative to the underwater cables passing through the Red and Mediterranean seas.

The four operators' scheduled date to start building the system was on July 1, 2010.
Under the agreement, the operators should perform the necessary physical connections on the national main fiber-optic backbones within their borders to make a 200 Gigabits per second capacity expansion in their systems.

Table 2: JADI terrestrial fiber cable route and landing stations

Country	Landing Station
Saudi Arabia	Jeddah
Jordan	Amman
Syria	Damascus
Turkey	Istanbul

Source: Arab Advisors Group

The fiber optic line should cover a total length of 2,530 kilometres. The line will extend over 920 kilometres in Saudi Arabia, 770 kilometres in Turkey, 480 kilometres in Syria and 360 kilometres in Jordan. **Table 3** below illustrates the JADI cable's lengths.

Table 3: JADI cable lengths

Country	Cable length (km)	Cable length (km)
Saudi Arabia	920	36.4%
Jordan	770	30.4%
Syria	480	19.0%
Turkey	360	14.2%
Total	**2,530**	**100.0%**

Source: Arab Advisors Group

The JADI cable will offer an important alternative in providing Internet (IP), data and partially voice communications. The cross-border fiber-optic connection is designed to be a viable alternative to the underwater cables passing through the Red and Mediterranean seas. This will assist in increasing redundancy and in decreasing the potential for interruptions in Internet connectivity. The system will also meet the rapidly increasing demand in the fields of international data and Internet services in the region. Consequently, this would enhance the competitive landscape in these countries.

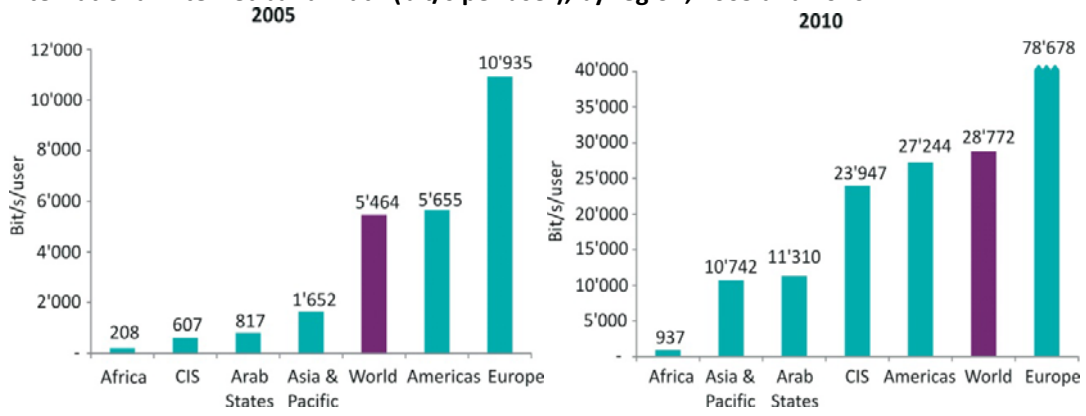
A number of smaller terrestrial cables exist between several Arab countries. For example, Iraq is connected to several neighboring countries via terrestrial cables, including: Iran, Syria, Jordan, Saudi Arabia and Kuwait. Saudi Arabia is also connected to Kuwait, Jordan, UAE, Bahrain, Qatar, Yemen and Oman, while Syria is connected to Lebanon, Turkey and Jordan.
Other terrestrial fiber-optic cables connect Egypt with Sudan, UAE with Oman, Jordan with the Palestinian Authority and Djibouti with Ethiopia. Several other terrestrial cables exist in the region.

There are also ongoing plans for connecting Algeria with Niger and Nigeria via terrestrial fiber optic cables in 2012. Further, the Malian government has announced a 942km fibre optic cable project which will link Bamako-Gao-Kidal-Tin-Zaoutière to the Algerian border and Gap-Ansongo-Labezanga to the border of Niger.

International Internet bandwidth is a crucial link in the provision and price of broadband services. International bandwidth has increased substantially between 2005 and 2010 (see Figure 1). While the Arab States have increased their international Internet bandwidth per Internet user from 817 in 2005, to over 11’000 by 2010, the Region still lags behind most of the other regions in the world. Within the region, the UAE, Saudi Arabia, Qatar and Bahrain have significant lead in the capacity.

Figure 1

International Internet bandwidth (bit/s per user), by region, 2005 and 2010



Source: ITU Measuring the Information Society 2011.

The last few years have seen a sea-change in the regulatory environment in the Arab region. Monopoly mobile markets have nearly disappeared – 13 countries are competitive. 14 have competitive internet markets. 15 countries have launched WiMax services. Table 4 details the regulatory environment in the Arab Region.

Table 4: ICT regulatory environment in the Arab Region, 2011

	Fixed voice services	Mobile services	Internet services	ADSL	WiMAX*	FTTx*
Algeria	Monopoly	Competitive	Competitive	Competitive	Available	Available
Bahrain	Competitive	Competitive	Competitive	Competitive	Available	Available
Comoros	Monopoly	Monopoly	Monopoly	Monopoly	Not Available	
Djibouti	Monopoly	Monopoly	Monopoly	Monopoly	Not Available	
Egypt	Monopoly	Competitive	Competitive	Competitive	Not Available	Available
Iraq	Monopoly	Competitive	Competitive	Monopoly	Available	Not Available
Jordan	Competitive	Competitive	Competitive	Competitive	Available	Available
Kuwait	Monopoly	Competitive	Competitive	Competitive	Available	Available
Lebanon	Monopoly	Monopoly	Competitive	Competitive	Available	Available
Libya	Monopoly	Monopoly	Monopoly	Monopoly	Available	Available
Mauritania	Competitive	Competitive	Competitive	Competitive	Available	Planned
Morocco	Competitive	Competitive	Competitive	Competitive	Available	Available
Oman	Competitive	Competitive	Competitive	Competitive	Available	To be launched
Palestinian Authority	Monopoly*	Duopoly*	Competitive*	Competitive*	Not Available	Not Available
Qatar	Competitive	Competitive	Competitive	Competitive	Not Available**	Available
Saudi Arabia	Competitive	Competitive	Competitive	Competitive	Available	Available
Sudan	Competitive	Competitive	Competitive	Competitive	Not Available	Not Available
Syria	Monopoly	Competitive	Competitive	Monopoly	Not Available	Not Available
Tunisia	Monopoly	Competitive	Competitive	Competitive	Available	Available
UAE	Competitive	Competitive	Competitive	Competitive	Available	Available
Yemen	Monopoly	Competitive	Competitive	Monopoly	Available	Available

* Data source: Arab Advisors Group

** Service was stopped in July 2011.

Source: ITU Telecommunications/ICT Regulatory Database, www.itu.int/icteye

The preceding discussion shows that the Arab Region presents a diverse picture. Some countries are well advanced and have high quality telecom infrastructure and some others lag behind. The mobile revolution has significantly affected the spread of telecommunications in the region. This however has come at the cost of investment in fixed infrastructure. Many countries need to invest in fiber deployment in both local access and backbone networks. Private sector can make investments only if they are confident of returns in

investment. It has also to be noted that there are variations within countries themselves, with less developed countries typically showing lower penetration rates, and with their rural and remote areas still lacking coverage.

Even among countries which witnessed broadband success making broadband sustainable and transformational will be a continuous challenge. Deeping broadband access must find a way to deal with the social and economic reality of the countries, particularly their rural and remote regions. This will require fresh and innovative solutions including more emphasis on bottom-up initiatives.

In the LDCs of the region significant sections of the population cannot afford new services because of low per capita incomes. Yet, there is high unsatisfied demand in all the countries. This presents an attractive opportunity to potential new players who can emerge as service providers given favorable market entry conditions. Much remains to be done in order to enable countries to expand telecoms to rural and remote areas and provide advanced ICT services. Coordinated efforts that complement ongoing initiatives with a focus on remote and/or underserved areas can make a significant difference within a short period.

3. CHALLENGES

In general, many of the Arab countries are facing serious challenges that can be summarized as follows:
Policy and Regulatory domain

- Establishing a separate ICT regulator in one third of the countries in the region
- Sometimes inadequate policies with respect to rural and remote areas;
- Availability of efficient national frequency plans;
- Not all Arab countries have liberalized their markets;
- Gaps in policy and strategy formulation, as well as implementation;
- Over 80 per cent of Arab countries enjoy competition in Internet services and around 60 percent have competition in DSL and fixed wireless broadband. The situation in other segments, however, such as cable modem (15 percent) and international gateways (54 percent) is less competitive;
- Specific problems of last mile;
- High risks for investment projects, in particular in rural and remote areas and high operational and maintenance costs, significantly exceeding possible revenues.
- Absence of a clear nationwide broadband plan that has a definite objectives and targets to stimulate a speedy broadband diffusion; and
- Inadequate policies in the media-telecom convergence.

Technical and economic domain particularly difficult for LDC Arab countries

- Availability of energy;
- Magnitude of investment required and the need - in most cases – for government funding and the gap between governments' available funding within the region.
- Scattered population increases the cost of infrastructure;
- Lack of resources for backbone and broadband network development;
- Lack of infrastructure including challenges of the geographical terrain – government offices for delivery of services, schools, hospitals etc;

End users/ Human Resources

- Low economic activity and low incomes;
- Limited availability of technical personnel;
- Low rates of literacy and digital literacy; and
- Limited technical and management competence in some areas.

4. OPPORTUNITIES

Attract new players with incentives: Unsatisfied demand for an affordable high speed access service represents a major opportunity for business development and the emergence of new players, who could

bring investment thus making available new technologies and services. While active participation of the private sector is essential to ensuring effective and viable broadband supply, governments have a key role to play in the introduction, expansion and provision of services over broadband. This may include a variety of incentives and the construction of public-owned networks. Some governments have provided direct subsidies for the construction of broadband networks while taking care of maintaining competitive supply. Other investment incentives may take the form of direct subsidies, low-rate loans and tax holidays, amongst others. Where public funds are not available for ICT development, the governments could explore other options to promote investments, such as Public-Private partnerships. Whichever strategy is adopted, open access is the key to success. Open access means that all suppliers, whether in horizontal or vertical markets, are able to obtain access to the new network facilities on fair and equivalent terms. In addition to deploying strategies to stimulate infrastructure development aimed at achieving wide service coverage of broadband, several demand-side policies aimed at promoting broadband adoption could be implemented, ranging from introduction of tax incentives to creating an enabling environment for SMEs to developing e-government services[4].

Role of Governments: Government can act as a catalyst to private sector broadband network deployment by becoming a major user of broadband networks deployed by the private sector. Government institutions such as schools, hospitals and community centers can provide an assured customer base for broadband services. This effectively provides a guarantee to private sector providers, creating an incentive for entry into un-served markets.
A major challenge that remains is how best to reconcile the business-oriented incentives of operators and investors with the sometimes conflicting socio-economic priorities of governments for the welfare of the citizens – which has been emphasized in WSIS goals and MDGs. Governments can also play their part in expanding access with regulatory reforms to help align the profit-oriented incentives of investors with principles of extending access through, for example, market reforms, licensing roll-out requirements, USF levies and by moderating their approach to the taxation of communication services. Governments could also reform their approach to the taxation of telecommunications. Consumers in developing countries often end up paying far more for equipment (e.g., mobile handsets and laptop computers) than in industrialized economies through the imposition of heavy import duties and taxes on luxury purchases. There is substantial evidence that governments stand to gain far more in tax revenues by reducing one-off import duties and sales taxes on the purchase of equipment.

The Content bottleneck: Availability of content addressing the local and specific needs of the countries imposes a limitation of the network and facilities already available. This is an opportunity to encourage the emergence of local content industry by enhancing human resource capacities in several areas. To turn these opportunities into viable avenues of investment, new approaches are needed, including innovative public-private partnerships, regulatory framework, pro-active policies.

New business models and financing mechanisms may help LDCs. In the Arab LDCs particularly in the rural and remote areas new business models and financing mechanisms may help in selling equipment and services to consumers with incomes that may be low and subject to cyclic variations.
The predominance of prepaid mobile subscriptions in developing countries arises partly from its ability to match consumer expenditure with variable or seasonal incomes.

Regulatory reforms have been successful. It is revealing that, for Arab's pioneering success story of mobile communications, 15 countries (or 71 percent of all ARB counties) had introduced a degree of competition into their mobile market by 2010]. The rest of the countries can take the opportunity to replicate this practice.

[4] For more analysis on this topic, see ITU, The impact of broadband on the economy, January 2012, to be published by mid of February 2012 www.itu.int/broadband.

Take advantage of transition from analogue to digital broadcasting: Modern broadcasting technologies can provide not only TV but also Internet and other services directly to individual users. This transition will free up frequency bands (the digital dividend) which among other services can be used for wireless broadband services. This item is on the agenda of the WRC-12.

5. RECOMMENDATIONS

Access to the Internet via broadband is important for the development of information societies. Individuals are able to obtain more services and a richer experience from the Internet; private and public sectors are able to add value to their online interactions with customers and suppliers and make them more efficient; and governments are able to enhance the e-government experience for their citizens.

Generally speaking the growth of broadband is largely due to competition and declining prices, but it also depends on available infrastructure. In many developing countries, because of the lack of economies of scale and infrastructure, the incentive to expand broadband outside urban areas is reduced. Wireless technology and satellites can help avoid the cost of infrastructure for remote or rural areas, or for areas without a critical mass of users. Governments have an important role to play in improving access to broadband through infrastructure creation and a series of policy initiatives; policy can either encourage or become a disincentive to competition, and thus impact availability and prices.

***Best practices*:** As countries plan for investments in broadband networks[5], it is critical that they do so within the context of a broader ICT sector development strategy. Some of the best practices supported by the ITU Global Symposium of Regulators (GSR)[6] include the following:

I. Make use of a wide range of funding mechanisms for promoting the deployment of broadband Infrastructure, in particular through leveraging multi-stakeholder partnerships and modernizing universal service programmes and funds.
II. Foster private investment in broadband through incentive regulation, notably by
1) Providing overall direction through a national policy
2) Rationalizing licensing regimes
3) Making spectrum available for mobile broadband
4) Removing barriers to broadband build-out and access to broadband networks and
5) Granting tax incentives.

III. Stimulate innovation and development of applications and services, especially through
1) Nurturing the creation and adoption of applications, services and digital content
2) Spurring investment in Research & Development activities and
3) Enforcing Intellectual Property Rights.

IV. Expand digital literacy to enable an accessible and inclusive digital economy.

While supportive policy and good governance are essential for broadband deployment and take - up to succeed, the private sector will play a central role in broadband development and a range of incentives need to be put in place to spur infrastructure build-out, traffic growth and service and application development alike.

Therefore, policy makers and regulators need to:

- Set out the general principles of open access – non-discrimination, effectiveness and transparency – highlighting the importance of both active and passive infrastructure sharing in the deployment of

5 ITU-D-SG2: http://www.itu.int/net3/ITU-D/stg/index.aspx
6 Best practice guidelines issued by ITU: http://www.itu.int/bestpractices;
GSR11 Best Practice Guidelines: http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR11/consultation/consultation.html

electronic communications networks in property owned by any operator, private entities and public bodies, from and beyond the ICT sector.

- . Ensure open access arrangements are made to maximize the economic benefits across as broad a base of users and suppliers as possible. This is particularly relevant where public funds are committed to broadband infrastructure investment.
- Build an adaptive regulatory framework by adopting a technology neutral approach, administratively simplified and flexible licensing regime providing for easy market entry of new players, such as through general authorizations and multiservice/unified licences.
- Adopt a technology-neutral approach, to facilitate the use of all transport mechanisms, and to promote the utilization of new and emerging technologies.

Adopt Appropriate Spectrum Management Policies

- Ensure efficient allocation and assignment of the digital dividend spectrum, resulting in social and economic benefits that could stimulate innovation for the provision of lower-cost communications and services, especially in rural and remote areas.
- New spectrum management policy and adequate and harmonized frequency allocation is crucial to the provision of wireless broadband services in rural and remote areas. In this regard, spectrum flexibility can open opportunities for new players to enter the market, with lower infrastructure costs, bringing greater choice and reducing the price of communications. The World Radiocommunication Conference (WRC-12) will play an important role. Standardization of broadband wireless access is important for utilization of broadband systems. ITU will continue to play an important role in that regard.

Encourage Investment in Broadband

- Standardized, reliable and safe as well as renewable energy systems are also important for utilization of broadband systems. Cost and quality of energy are seen as future challenges to be addressed in the provision of broadband to rural and remote areas.
- Administrations should encourage public–private partnerships (PPP) in conducting projects to overcome economic barriers. Attention should be paid to encourage a combination of public and private funding aimed at deploying broadband infrastructure. Approaches such as delegation of public services and, revenue sharing schemes are also recommended for facilitating the development of high speed broadband.

- Making use of complementary universal service provisions should be taken into consideration to address a digital divide between those with access to high speed broadband and those without. It is the administration's role to define and develop a sustainable universal service policy and strategy.

- Encourage the roll-out of broadband infrastructure (especially in remote and underserved areas) by providing suitable incentive schemes such as tax incentives, lower regulatory or spectrum fees and by facilitating access to rights of way.

- It is recommended to create a nationwide broadband plan in each country in the region that has clear objectives, targets, policy directions and funding schemes.

Create demand for Broadband Services

- Design policies to create demand for services, as an essential element of the strategy for effective and productive use of infrastructure.

- Ensure that the state look to invest in complementary activities in addition to infrastructure. By investing in e-services for public administration, education, health care, or funding the development of local content, governments can make broadband services more relevant to their citizens. This will create incentives for getting more people online.
- In order to promote the use of broadband, administrations should connect local government buildings, educational institutions and hospitals that either lack broadband options or pay exorbitant fees to incumbent phone companies.
- Access to broadband should be coupled with sufficient focus on increasing PC/laptop/tablet penetration and enhancing e-skills through demand stimulation measures such as training for students, low skilled groups and professionals, and subsidizing equipment/installation/subscription costs

Infrastructure development which addresses the needs of the countries will necessarily involve the participation of governments, industry, financial institutions and other stakeholders as part of a shared effort to connect the Arab Region.

It is recommended that a two pronged approach is followed - the first relating to access networks and the second on the national and regional backbones.

PART B

TRANSITION FROM ANALOGUE TO DIGITAL TERRESTRIAL TELEVISION BROADCASTING AND SPECTRUM MANAGEMENT

a) Transition from analogue to digital terrestrial television broadcasting

1. SUMMARY OF EXISTING SITUATION

Transition from analogue to digital terrestrial television broadcasting presents governments, broadcasters, regulators and the general public with immense opportunities and challenges. Digital terrestrial broadcasting provides possibilities for adding new programmes and interactive multimedia services. Digital broadcasting uses spectrum more efficiently and will free up spectrum for other uses. Spectrum that will become available as a result of the switch-over- the digital dividend - can be used for other services, including broadband mobile services. This section briefly describes factors that need to be considered in preparing a roadmap for the transition. Providing assistance in ensuring a smooth transition from analogue to digital terrestrial broadcasting is one of the key objectives. This will enable the introduction of mobile TV and interactive multimedia services and applications and free spectrum for broadband wireless services.

The advantages of digital broadcasting from the stand-point of technology, industry and policy can be summarized as follows:

- More programmes can be provided compared to analogue technology through the same bandwidth;
- Digital technology makes it possible to deliver content more efficiently and effectively;
- Offering viewers interactive services ranging from the provision of information to transaction services (such as television shopping, and banking, etc.);
- Transmitting high-quality video and audio programmes;
- Efficient use of spectrum, compared to analogue TV;
- Making available the radio frequency spectrum - this is the commonly cited Digital Dividend, which can be used for additional TV services (free-to-air or pay-TV), HDTV services, wireless broadband communications and mobile communications; and
- As a result of convergence, broadcasting networks will be capable of providing services such as data-casting and Internet access etc., while other networks can provide broadcasting services such as video on demand and IPTV.

The plan for the digital broadcasting transition in the region is shown in the following table

Digital broadcasting transition plan

Arab countries	Mobile TV broadcasting (IP-Based / DVB) service	IPTV service	Digital Terrestrial broadcasting service	Planned Analogue switch-off (ASO) date
Algeria	Not Available	Available	Planned	2014
Bahrain	Available	Available	Planned	2013
Egypt	Available	Planned	Planned	2015
Iraq	Available	Not Available	Available	Unclear
Jordan	Available	Available	Planned	2015

Kuwait	Available	Not Available	Not Available	2015
Lebanon	Not Available	Available	Not Available	2015
Libya	Available	Not Available	Not Available	2015
Mauritania	Not Available	Not Available	Available	Unclear
Morocco	Available	Available	Available	2015
Oman	Available	Not Available	Planned	2015
Palestinian Authority	Not Available	Not Available	Not Available	Unclear
Qatar	Available	Available	Not Available	Unclear
Saudi Arabia	Available	Available	Available	2015
Sudan	Not Available	Not Available	Available*	2015
Syria	Not Available	Not Available	Planned	2014
Tunisia	Available	Not Available	Available	2015
UAE	Available	Available	Planned	2013
Yemen	Not Available	Not Available	Not Available	2015

*Reportedly
Source: Arab Advisors Group

Concerning mobile TV broadcasting the digital television transition is corresponding to the terrestrial TV transmissions only since on satellite, IPTV, 3G/4G networks digital already exists.

All of the Arab countries are part of the GE-06 plan. As a consequence the latest analogue switch off date is 17 June 2015 (for some countries in some frequency bands this deadline is 17 June 2020). Some countries are well advance in the process; some of them are still at the beginning or have not yet started.[7] In order to use the available frequency spectrum efficiently, harmonization in the implementation of the use of the digital dividend is important.

Twelve countries in the Arab Region have deployed, or have transition plans for deploying digital terrestrial broadcasting. Most of these countries have frequency plans, and have chosen to deploy the DVB-T standard. However, only a few indicated that a legal and regulatory framework is in place. The duration of the transition ranges from 18 to 91 months. With the exception of Morocco and Saudi Arabia, most of these countries have a limited number of DVB-T transmitters on air. It is worth mentioning that DTH Satellite broadcasting is available in all countries in the Arab Region.

In Algeria, the termination of analog television and full transition to digital transmission is scheduled to take place in 2014. The Télédiffusion d'Algérie (TDA) is following a three-phased action plan. TDA announced that it has begun implementing the first phase of the project. Digital broadcasting is expected to be operational by the end of the first quarter of 2012. IPTV is operational in Algeria market since February 2010. The service is offered by Algérie Télécom Group.

Digital terrestrial is not yet operational in Bahrain. However, IPTV is operational in the Bahraini market. Nuetel launched their IPTV services in February 2007, and by September 2011 they provided IPTV services only to Reef Island and Amwaj Island. Batelco, the incumbent operator, launched its IPTV services in September 2011 and it provided the service in two newly developed areas of Reed Islands only. Mobile TV services in Bahrain are provided by Viva.

[7] Jordan, for example, has planned for the digital transition in two stages. The first stage consists of the main TV broadcasting stations (11 cities), beginning 2012 and completed by end of 2012. The second stage consists of transitioning in the rural and remote areas and will be implemented in 2013-2015. There will be one year of overlapping after the first stage between digital and analogue broadcasting to allow end users to upgrade their receivers.

Egypt has the largest number of headquarters of regional DTH/Satellite channels in the Arab Region. With regard to Digital TV, the NTRA is currently considering the spectrum band 790-862 MHz as part of the digital dividend and shall consider also the spectrum band 698 -790 MHz as future extension. Mobile operators are offering mobile TV. The Egyptian Advanced Multimedia Systems (EAMS) provides satellite based IPTV services; however, the service is not commercially launched yet. Mobile TV services are provided by Mobinil and Etisalat Misr.

Alsumaria TV is the only channel that has DTT in Iraq. IPTV services are not available in Iraq. Using the digital video broadcasting handheld (DVB-H) technology, Mobision, part of Alsumaria Broadcasting Service Company, is the single Mobile TV (DVB) service provider in Iraq.

IPTV is operational in the Jordanian market. Currently, Orange Jordan is the only IPTV provider in Jordan. Orange Jordan commercially launched IPTV and VoD services in last quarter of 2008. Orange Jordan is the only mobile TV through 3G service provider in Jordan. Jordan radio and television is responsible for the transition from analogue to digital terrestrial broadcasting in Jordan. A budget has been allocated for the transition for the years 2012 and 2013.

Digital terrestrial broadcasting is not operational in Kuwait. However, the country had signed an agreement in 2006, according to which DVB-T will be implemented in Kuwait by 2015. Mobile TV is provided in Kuwait through two cellular operators; Zain Kuwait and Viva.

Television services in Lebanon are delivered via Ultra High Frequency (UHF) Free to Air analogue TV, Unlicensed Cable TV and wireless distribution, MVDS and DTH Satellite TV. All the UHF terrestrial television broadcasters in Lebanon are employing analogue transmission networks with multiple transmitter locations. The main digital television services are delivered via satellite & DVB-MS operators. On May 2008, Sofrecom carried-out, in partnership with Orange Business Services, an operational IPTV deployment for “Solidere” area, in downtown Beirut, Lebanon. Mobile TV is not operational in the Lebanese market.

In 2007, Libyana has begun a trial of DVB-H mobile TV technology in Tripoli with cooperation with the French solutions providers, Enensys. Mobile TV services are provided by Libyana. IPTV is not operational in Libya.

Mauritania is still behind when it comes to digital broadcasting. Both, IPTV and Mobile TV are not operational in the country. By December 2011, Mauritania had one state owned digital terrestrial channel and one state owned DTH satellite channel.

In Morocco, the Société Nationale de Radiodiffusion et de Télévision (SNRT), provides both digital terrestrial and mobile TV (DVB) broadcasting. 3G Mobile TV is provided by Maroc Telecom. Maroc Telecom and Meditel provide IPTV services in Morocco.

Currently, Oman is the only country in the region that does not have terrestrial TV. All local channels are broadcast through satellite DTH. However, in accordance to Article 8 set out in the Telecommunications Regulatory Act issued by the Royal Decree No. 30/2002, and its Executive Regulations and the Telecom Sector Policy, the TRA is in the process of developing regulation for the introduction of DVB-H Technology in the country. IPTV is not operational in the Omani market, although there are no regulatory hurdles for national fixed and mobile licensees to offer the service. Mobile operators, Nawras and Oman, are providing 3G Mobile TV since 2009.

Digital terrestrial broadcast transmission is not operational in Qatar. The incumbent operator, Qtel, provides IPTV and mobile TV (IP-based) services.

Digital Terrestrial Broadcast transmissions began in Saudi Arabia on June 2006. The first phase of digital terrestrial television transmission (DTT) included forty cities in the Kingdom. As for IPTV, STC deployed IPTV and triple-play services through its FTTH network. On August 2010, STC announced the launch of “Invision”, a triple-play service which includes IPTV, broadband Internet and fixed telephony in one bundle. Mobile TV services are provided by the three cellular operators.

In Sudan, digital terrestrial broadcast transmission is reportedly operational. However, both, IPTV and Mobile TV are not operational in the country.

IPTV and Mobile TV services are not operational in Syria. The Ministry of Information had plans to start the switch of terrestrial channels from analogue to digital by mid 2011; however the commencement of the project was delayed.

Digital Terrestrial Television in Tunisia is regulated through the National Broadcasting Corporation. The DTT project in Tunisia consists of two phases; the first phase, which started in 2001, included the experimental implementation of a digital TV broadcasting unit using DVB-T system and MPEG-2 compression in Boukornine. The second phase of the project includes two parts. The first part was completed in 2009, and covered the digitization of the transmission network between production studios and the different broadcasting stations in Tunisia. The second part includes the terrestrial broadcasting network to viewers. Tunisie Telecom announced that it is in the process of upgrading its network in order to start providing services that include IPTV, however, the service is not operational yet. By December 2011, Orange Tunisie was the sole provider of Mobile TV services in the country.

In December 2009 the UAE’s Telecommunication Regulatory Authority (TRA) published "Terrestrial Digital Switchover" plan. According to the plan of four phases, the existing analog TV broadcasting operators shall switch-off their analog TV transmitters maximum by December 2013. IPTV is offered through Etisalat’s subsidiary E-Vision, which was established in April 2000. Du IPTV service was introduced with the operator’s launch in 2007. IP based Mobile TV is offered by Etisalat and du. As for DVB-H Mobile TV, the TRA granted the license to the “Emirates Mobile Television Corporation" consortium in November 2009, making the United Arab Emirates the first country in the region to issue such a license.

The Palestinian Authority and Yemen are still behind when it comes to digital broadcasting. Mobile TV, IPTV and Digital terrestrial broadcast transmission services are not operational in these countries.

Digital Satellite TV broadcasting is widely used in the Arab Region despite having quite a few providers of the DTH satellite platforms. FTA is widely used across the region. Satellite Pay TV is also popular and is widely pirated.

The main hindrance for the transition from analogue to digital terrestrial broadcasting is that terrestrial TV viewership in the region has fallen drastically as households switch to the wider choices and richer content of Satellite TV. End users in the region, for the most part, are not used to paying for content due to the plethora of free content.

Challenges regarding the transition from analogue to digital broadcasting include: Convergence, technology, new services, operation, network design, business case and budget. The re-allocation of spectrum (digital dividend), the regulation of new services including private channels, and the position of multiplex operator in the value chain in addition to the convergence between broadcasting and telecom are some of the effects of the transition from analogue to digital broadcasting on regulation.

There is an evident need for cooperation between the regulatory and the industry representatives in the Arab Region. Developing new enhanced broadcasting services and workable business models, in addition to providing financial and commercial support as well as Set-Top-Box subsidies that are suitable for different kind of services should be provided by the industry.

IPTV and Mobile TV are not widely adopted in the Arab Region. IPTV is deployed in 8 countries, whereas Mobile TV services were implemented in 12. Eleven countries have deployed 3G IP-based Mobile TV, compared to only 3 for DVB Mobile TV.

Waiting until the technology is mature and the lack of demand from the end users are some of the main reasons behind not deploying IPTV and Mobile TV in several countries in the Arab Region. Other reasons include insufficient financial resources, unprofitable business models, lack of content and the lack of clear regulatory frameworks. Further, Technical, legal and regulatory, content, marketing and competition and frequency obstacles hinder the implementation of Mobile TV.

Top drivers of IPTV and Mobile TV include: Adequate and reliable infrastructure, attractive content, good business model, adequate regulatory framework, good marketing and promotion, reduced broadband subscription fee, mature specifications and cooperation of actors in value chain.

2. CHALLENGES OF TRANSITION

The transition process is not a simple matter of technology - there are challenges to be overcome for a smooth transition, such as:

- Regulators: Regulators need to review the rights of license conditions including spectrum rights and broadcasting rights and to decide on various technological options such as transmission technology, TV presentation format, compression technology and simulcast policies. These include the duration of any simulcasting period and how to approach simulcasting – for example, whether through a phased or national approach. Regulators also need to develop spectrum policy on where and for which services the digital dividend could be allocated and to modify national frequency plans to meet the increased needs during the simulcast period.
- Operators: Operators need to decide network planning options such as Multi-Frequency Network (MFN)[8] and Single-Frequency Network (SFN)[9] and identify key applications.
- Consumers: Consumers need to use set-top boxes or replace their current analogue equipment (main television, secondary televisions and video–recorders) with digital receivers.

There are major issues which need to be addressed in the licensing of Digital Terrestrial Television (DTTV). They include:

- assigning spectrum rights;
- assigning broadcasting rights; and,
- assigning operating rights, which also include the multiplex operator. The ownership and assignment of resources of the multiplex is crucial, because multiple programmes or services can be carried on one multiplex.

Regulators can balance the importance of these rights in different ways, so the applied licensing framework for DTTV has tended to vary from country to country and comes in many different forms and definitions.

[8] Multi-Frequency Network: the network of transmitting stations using several RF channels.
[9] Single-Frequency Network: the network of synchronized transmitting stations radiating identical signals in the same radio-frequency (RF) channel.

The process of elaborating a licensing framework would imply that attention needs to be paid to the following factors:

- spectrum management objectives;
- competition rules and objectives;
- market structure and environmental objectives;
- media rules and objectives; and,
- convergence trends.

It is important to note that modern broadcasting technologies can provide not only TV but also deliver Internet and other information services directly to individual users. Transition from analogue to digital broadcasting provides a unique opportunity for the introduction of new ICT services on the platform of interactive multimedia broadcasting systems.

Many of the 1 billion people who live with some form of disability are unable to enjoy the audiovisual content that comes to their homes either because the content, information and/or devices necessary for them to access these services are not accessible for them. Yet, solutions exist today that can make it possible for them to fully enjoy television, and which can help them participate in many more aspects of social and cultural activity. These include closed captioning and signing for the deaf, audio description and audio captions for the blind or those with visual impairments, and accessible remote control devices for the elderly and those with reduced dexterity[10]. The transition to digital terrestrial TV broadcasting represents an ideal opportunity for countries in the region to take the necessary steps to ensure TV is accessible to persons with disabilities.

3. RECOMMENDATIONS

The transition to digital broadcasting is a complex process, requiring the involvement and cooperation amongst legislators, regulators, broadcasting companies (content producers, broadcasters and network operators), manufacturers and viewers. Countries need to take decisions on the key political and technological issues, based on technical and economic analysis, the availability of relevant devices and equipment and the readiness of viewers, whilst taking into account the relevant international regulations such as ITU Radio Regulations and regional and bilateral commitments. To overcome these challenges and to migrate to digital broadcasting requires adept policy and regulatory measures and careful choice of technologies, whilst considering the effect on end-users, particularly the poorer sections of the population.

Some common key factors driving a successful transition can be recommended to countries which are embarking on the process of transition to digital broadcasting:

- A successful digital switchover and analogue switch-off (DSO/ASO) will require the active participation of, and coordination between, the Government and the television industry. Only by working with Government and the regulator can the broadcast industry ensure a minimum amount of disruption for viewers;
- The decision to stop analogue television services needs strong leadership to affirm when and how the analogue switch-off will proceed and define a clear roadmap. This can provide credibility to the process and help avoid unnecessary delays; and
- Viewers need to have access to sufficient information in a timely fashion, including: why the DSO/ASO process is planned and what the benefits will be; the availability of alternative television

[10] These solutions and the practical steps that can be taken to ensure that television becomes accessible are explored in a new BDT thematic report, “Making TV Accessible” available at http://www.itu.int/ITU-D/sis/PwDs/index.phtml. A series of podcasts further exploring these issues is available at the same link.

platforms; the date when the analogue terrestrial television will end; new equipment needed; and finally the costs associated with receiving digital television programmes.

- Countries in the Arab region may wish to consider using the transition to digital terrestrial TV broadcasting as an opportunity to take the necessary steps to ensure that TV is accessible for persons with disabilities in line with the practical steps identified in the BDT Thematic Report, "Making TV Accessible."

The above discussion highlights the need to ensure a well-coordinated approach for the analogue to digital terrestrial television broadcasting transition among countries in the region. This will necessarily involve the participation of governments, industry, financial institutions and other stakeholders as part of a shared effort to connect the Arab Region.

- The Arab region may wish to consider establishing a coordination group for harmonizing the digital broadcasting transition process, collecting relevant information and practices of countries which have already switched to digital broadcasting. This will also help in the process of capacity building and coordination of the utilization of the digital dividend.

b) Spectrum management

1. SUMMARY OF EXISTING SITUATION

With the changes in the telecommunication sector, the introduction of competition, the rapid deployment of mobile and wireless technologies and the high demand for frequencies from the operators, etc. the importance of spectrum management and of its effective and efficient use has become increasingly recognized by countries.

In order to properly deal with the fast changes of the ICT environment, in particular the rapid technological changes and the convergence of technological platforms, there is a need for developing and promoting regional harmonized ICT policy and regulatory framework in the field of spectrum. This would encourage private sector participation and investment and ensure more efficient and rational allocation and use of the spectrum.

A number of countries in the region lack effective spectrum management plans that timely respond to technological changes spectrum requirements**.**

It is important for the region to address the policy, regulatory and technical challenges facing the countries in the field of spectrum management, to strengthen regional organizations and countries of the Arab region in the fields of frequency planning and assignments, spectrum management and radio monitoring by fostering regional cooperation through the development and implementation of harmonized policies and practices in spectrum management, the establishment of spectrum management system and human and institutional capacity building in this field.

2. RECOMMENDATIONS

In order to harmonize the spectrum use in the Arab region and in the sub-regions it is recommended to develop harmonized National and Regional Frequency Allocation Tables (NFAT and RFAT).

Countries who do not have it establish their National Spectrum Management System which can be based on the ITU developed Spectrum Management System, the SMS4DC.

For efficient spectrum use set up harmonized borderline frequency coordination mechanism e.g. based on the agreement used in Europe, the HCM (harmonized calculation method) and develop a regional Spectrum Pricing Policy Framework

Enhance regional expertise through capacity building activities.

PART C

Building a Broadband-Enabled Economy and ICTs for the Social and Economic Development

Part A of this Background Paper focuses on building broadband infrastructure. Part B focuses on the transition from analogue to digital television broadcasting and spectrum management. Part C focuses on infrastructure of a different kind – a nation's human capital – and leveraging the investment in broadband infrastructure to develop in the Arab region a competitive, broadband-enabled, knowledge-based economy and the social and economic development of persons with disabilities and women.

3. SUMMARY OF THE EXISTING SITUATION

Recognizing Human Capital as Infrastructure

It is recognised that an important determinant of a country's competitiveness in the global economy is its human capital, in particular the skills, education and productivity of its workforce. The building of human capital -- which includes men and women alike -- begins at primary schools and extends all the way to universities, research and development centers and trade or 'applied' schools. Adult persons with disabilities and women who did not receive or complete their education as children, and who therefore lack basic language literacy, digital literacy and job skills, can also be part of this process. ICTs can be used to deliver training and education and to ensure that children with disabilities receive an inclusive education moving forward.

A skilled and educated workforce will enable the Arab region to develop a vibrant knowledge society and respond to the evolving ICT industry. Indeed, education and ICTs are two of the four essential pillars of a knowledge society[11]. The World Bank's Knowledge Assessment Methodology, lists three major education indicators to assess a country's preparedness to compete in the knowledge economy – adult literacy rates, secondary school enrolment rates, and enrolment in tertiary education. This interactive benchmarking tool, evaluates a country's preparedness to compete in the knowledge economy. Figure 2, which includes 15 countries from the Arab Region, compares their Knowledge Economy index from 1995 and 2009. The Gulf countries score comparatively higher, and have been able to implement changes faster, likely due to the vast resources at their disposal.

[11] The four pillars of the knowledge society include:

- An economic and institutional regime to provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship;
- *An educated and skilled population to create, share, and use knowledge well*;
- An efficient innovation system of firms, research centers, universities, consultants and other organizations to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology; and
- Information and communication technology to facilitate the effective creation, dissemination, and processing of information.

Entrepreneurship and innovation are addressed in the Innovation Background Paper.

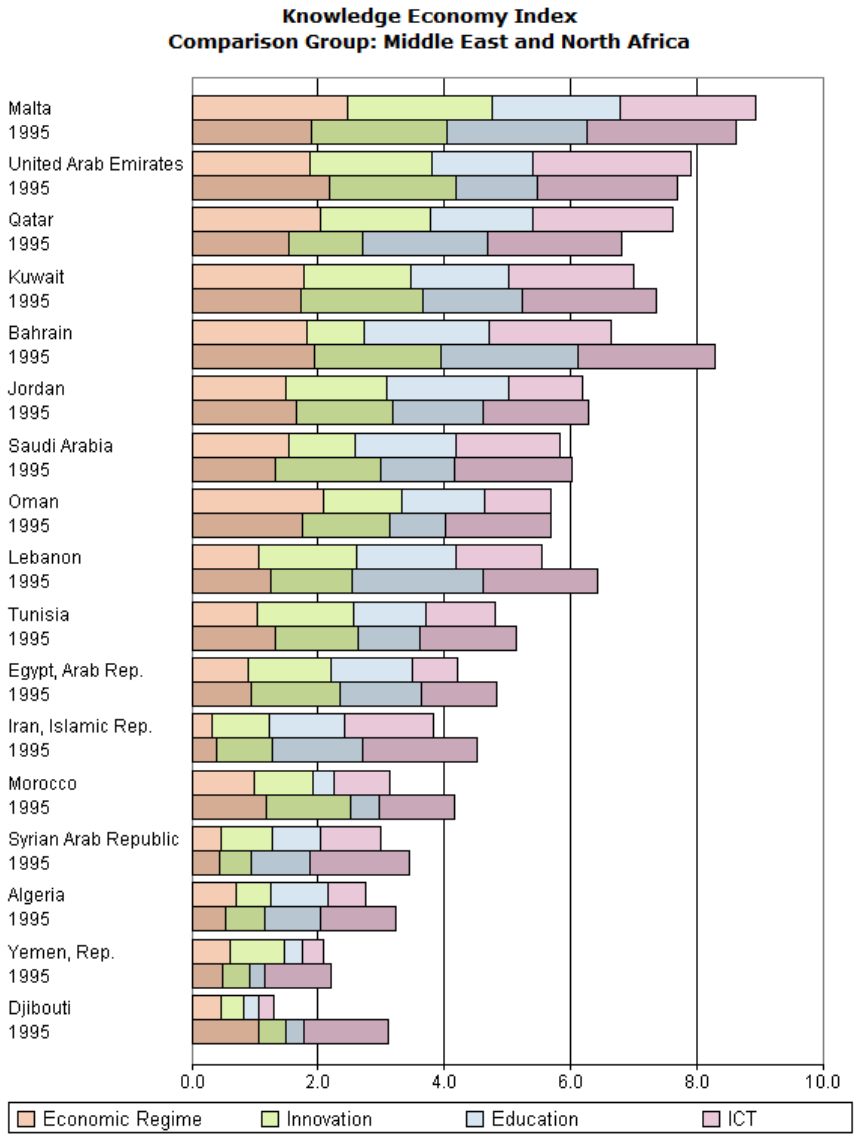


Figure 2

4. CHALLENGES AND OPPORTUNITIES

4.1 Literacy and Basic Education

4.1.1 Challenge

The *Arab Knowledge Report 2009* [12] carried out a review of knowledge capital accumulated by educational institutions in the Arab countries in an attempt to analyze the quantitative and qualitative dimensions at the various levels and stages of education. According to this report, the Arab region lags behind most of the rest of the world in adult literacy rates, secondary school enrolment rates, and enrolment in tertiary education, ranking sixth out of eight regions of the world, placing higher only than South and West Asia and Sub-Saharan Africa.

[12] A joint report sponsored by the UNDP and the Mohammed bin Rashid Al Maktoum Foundation (MBRF), found at http://www.mbrfoundation.ae/English/Documents/AKR-2009-En/AKR-English.pdf

Who make up the ranks of those excluded from an education? Many of them are persons with disabilities, girls and women. Over one billion people worldwide live with some form of disability, this includes between 93 and 150 million school-age children. According to the World Health Organization-World Bank 2010 World Report on Disability, many adults and children with disabilities have been excluded from mainstream education opportunities and are more likely than their non-disabled cohorts to be excluded from an education[13]. Likewise, girls in rural areas are frequently excluded from an education. According to the UNESCO 2010 Education for All report, "just under half of poor rural females aged 17 to 22 in Egypt have fewer than four years of education and in Morocco the rate is 88 per cent[14]". It is not surprising, therefore, that globally, some 759 million adults, two thirds of them women, lack basic reading and writing skills, according to UNESCO[15]. UNESCO statistics for 2008 estimated that there were 39 million illiterate women in the Arab world, with certain countries suffering from extremely low female literacy rates,[16] with a regional adult illiteracy rate of 29 per cent[17].

4.1.2 Opportunity: Broadband-enabled Second-Chance Education

Policy makers are increasingly focusing on second-chance education schemes to provide basic life skills (e.g. language literacy and numeracy) and vocational training to address the needs of generations of women and persons with disabilities who have not completed their education. One of the opportunities of creating a broadband economy is the ability to provide online language literacy and vocational training and to promote widespread digital literacy among adults to enhance business development and job creation.

A number of countries in the region have begun to take action to address this need. Egypt, for example, has developed a CD-ROM illiteracy eradication program, based on Egyptian dialogue, culture and heritage. Likewise, the Arab League Educational, Cultural and Scientific Organization (ALESCO) has developed an initial set of CD-ROMs to teach standard Arabic to illiterate adults, designed so they could be used across the Arab region.

4.2 Computer Technology Instruction and Analytical Reasoning

4.2.1 Challenge

The *Arab Knowledge Report 2009* also notes the total absence of computer technology instruction in many countries and the scarcity of countries that have introduced this subject into their primary school curricula. The *Report* further states that:

> …Arab educational curricula in general are almost entirely lacking in activities aimed at developing learners' abilities to collect, organize, sift, and analyze information...The acquisition of such skills is intimately connected to the development of the higher mental faculties individuals must possess if they aspire to participate in the knowledge society.

The acquisition of these key skills is necessary to promote entrepreneurship, innovation and research and development, in addition to effective participation in the knowledge society. These challenges are particularly acute for the region's burgeoning youth population who currently face high unemployment levels. Sixty percent of the region's population is under the age of 15, while unemployment levels in the

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[13] World Report on Disability, 2010, p. 205 http://whqlibdoc.who.int/publications/2011/9789240685215_eng.pdf. This report, like UNESCO's 2010 Education for All (EFA) report highlight the staggering education problem faced by children with disabilities based on an analysis of 51 selected countries which does not include an analysis of the Arab region as a whole.

[14] See 2010 Education for All report, p. 9 at http://unesdoc.unesco.org/images/0018/001866/186606E.pdf

[15] See 2010 Education for All Report at http://unesdoc.unesco.org/images/0018/001866/186606E.pdf and 2008 UNESCO statistics at http://www.uis.unesco.org/literacy/Pages/Literacy-adult-youth-2011.aspx

[16] These include Mauritania, Morocco, Sudan, and Yemen. In Algeria and Yemen, the illiteracy rates for women are more than twice those of men. (2010, EFA at 96).

[17] EFA 2010 at 97.

region are among the highest in the world. The World Bank has suggested that 100 million new jobs need to be created in the region before the year 2020.
Likewise, the high cost of personal computers and laptops has added to the cost of connecting schools, making it more difficult to provide computer technology instruction in schools.

4.2.2 Opportunities: Curriculum and Connectivity for a Broadband World

One of the opportunities presented by these challenges is for the region to revise its educational curricula to ensure schools develop the necessary skills to enable Arab citizens to fully participate in the knowledge society and to develop an ICT workforce that generates employment and keeps up with the fast-paced and dynamic ICT sector This means that governments across the region have the opportunity to promote ICT skills in primary, secondary and higher education, ensure that graduates from its technical schools and universities emerge with skills that match employer demand, and invest in on-the-job and industry-based training initiatives with a focus on promoting advanced ICT skills in and with the private sector.

These goals will be facilitated by ensuring that the region's schools are connected to broadband services and equipped with low cost computing devices[18], including accessible ICTs to ensure an inclusive education for children with disabilities. Connected schools can also be leveraged as community ICT centres to provide training to the generation of users so far left behind, including in rural and remote areas[19]. Jordan has an initiative called "community centers' to introduce ICTs in remote and deprived areas for the purpose of digital literacy and addressing training needs of the local community. More than 180 centers are active, while Oman. is training teachers to use assistive ICTs to assist children with disabilities and has provided digital literacy training and certification to women in community centres.

Using low-cost, Open Source tablets also makes content development easier and facilitates the distribution of free and paid educational content through App-stores, creating business opportunities for publishers and leading to sustainable deployment models.

Some countries in the Arab world have already launched ambitious education projects to promote development of a knowledge society. Some striking examples (by sheer scale) of education projects include:

- Saudi Arabia which allocated more than $2.4 billion for the King Abdullah Project for the Development of Public Education (Tatweer); The project, seeks to improve the overall quality of education - in turn producing generations of Saudis who would contribute to the development of the nation and society, and guarantee the availability of a highly skilled and motivated work force in Saudi Arabia.
- The Jordan Education Initiative (JEI), launched in 2003, and winner of the UNESCO prize for the use of ICT in education. Education reform has led to specialized curricula for ICT-track high school

[18] The Connect a School, Connect a Community toolkit includes a module on Low Cost Computing Devices for schools. See Module 2 at http://www.connectaschool.org/itu-module-list It examines a variety of low cost devices such as the Intel Classmate and Mobilis from India at http://www.connectaschool.org/itu-module/8/93/en/schools/connectivity/devices/section_2.1/LCCDs_education/. India has also developed the Aakash Android-based tablet priced as low as USD 35 per unit. The full module includes an analysis of many of the issues to be considered by governments interested in developing programs for the distribution of low cost computers in schools, including teacher training, funding, gender issues, sustainability, etc.

[19] See the ITU Connect a School, Connect a Community Toolkit of Best Practices and Policy Advice and Repository of Training at www.connectaschool.org. The Toolkit shares best practices on the policies and practises needed to connect schools develop low cost lap top programs and design community ICT centres for women, indigenous peoples and persons with disabilities. The Training Repository has many training materials that can be used by these populations for their social and economic development.

diplomas, creating a generation of tech-savvy students. Jordan today has the highest rate of engineers per capita in the world. While Jordan's ICT sector employs one percent of the workforce it contributes to 14% of GDP;

- Qatar's Education City, a flagship project of the Qatar Foundation, one of the Arab world's most ambitious education experiments. Established in 1995, Qatar Foundation emphasizes the importance of education as the basis of a successful society. WISE – the World Innovation Summit for Education – is the Foundation's latest initiative to encourage global cooperation in shaping 21st century education models;
- The United Arab Emirates (UAE) Knowledge Village, which has attracted over 150 Western academic and technical institutions;
- The UAE Mohammed bin Rashid Al Maktoum Foundation (MBRF), a billion dollar fund that was established in 2007 for the sole purpose of facilitating creation of a knowledge based society in the MENA region (Middle East and Northern Africa)

4.3 Beyond Infrastructure: Addressing the special needs of persons with disabilities and women

4.3.1 Challenge

ICT Applications and Services to respond to the special needs of persons with disabilities, women and those living in rural or remote areas

Why are countries developing programs to address the ICT needs of persons with disabilities and women? Traditionally, the main goal of universal service and access policies has been on promoting and funding network rollout. Less attention was paid to the users of these networks and services. The underlying belief was that if networks were deployed everyone would use them. More recently, due to international agreements such as the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD)[20], policy makers, regulators, operators and users' groups seek to ensure that networks are accessible, affordable and used for the social and economic development of marginalized populations. They recognize that building infrastructure alone is not enough. Persons with disabilities, for example, must also have accessible and assistive technologies adapted to their needs in order to use the internet or a phone, while women may require language literacy training in order to use job-training sites on the web. In addition to developing policies and regulations to ensure that accessible ICTs are available for persons with disabilities and that women receive the necessary education and job skills, universal service funds can play a role to subsidize the cost of assistive technologies and smart phones with accessible apps for persons with disabilities, develop text-to-speech engines in local languages and fund programs to train women to become digitally literate.

4.3.2 Opportunity

Promoting the digital inclusion of people with special needs can be addressed as a legal or social obligation as well as a business opportunity and part of a broader strategy to stimulate broadband demand. The UN CRPD requires ICTs such as mobile telephony, television, and the Internet to be accessible for persons with disabilities.[21]. Policy makers and regulators in some countries in the Arab region have begun developing frameworks to promote ICT accessibility for persons with disabilities, such as codes of conduct for mobile operators, regulations on captioning for TV broadcasting and implementing web accessibility guidelines. A few leading mobile operators from around the world are successfully addressing the needs of seniors and

[20] Ten countries in the Arab region have ratified the UN CRPD: Algeria, Bahrain, Egypt, Jordan, Oman, Qatar, Syria, Tunisia, United Arab Emirates and Yemen. See http://www.un.org/disabilities/countries.asp?id=166. The United Nations Convention on the Rights of Persons with Disabilities has established a universal framework for disability rights with guidelines for policy makers and regulators.

[21] Article 9 of the United Nations Convention on the Rights of Persons with Disabilities establishes obligations for States Parties to ensure that the physical environment, transportation and information and communication technologies are made accessible to persons with disabilities, both by public and private entities.

persons with disabilities, making a good business case to promoting accessibility. In Egypt, Etisalat purchases bulk licenses of screen readers and make them available free of charge to their blind users, through cloud computing. ITU has a number of resources on promoting accessible ICTs for persons with disabilities for use by both the public and private sector[22] .

In addition, to using ICTs for women's social and economic development through second-chance training, as explored above, there is also need to ensure that women become more represented in the ICT sector itself for a number of compelling economic reasons. The growing ICT sector generally offers more competitive pay and working conditions which will improve women's social and economic status. Closing the male-female employment gap is good for economic growth while gender diversity in leadership positions is good for business performance. Studies exploring the link between women in leadership positions and business performance have shown a positive correlation between gender diversity on top leadership teams and a company's financial results.

Perhaps the most compelling reason to promote women into the ICT sector is that there is an overall increase in demand for technical workers. Estimates from Europe, the United States and Brazil alone predict a skills gap in the ICT sector of over 1.7 million in the coming years. As technology consumers, women are important market influencers. As more and more women are using technology and related services, it makes sense for women to be the ones designing and developing more of the products and services available. For these reasons, ITU and its members have agreed to recognize Girls in ICT Days on the 4th Thursday of every April where girls and university students are invited to spend the day at the office of ICT companies and government agencies so they better understand the opportunities the ICT sector holds for their future. Information on a range of programs designed to encourage more girls and young women to enter the ICT sector are available on the ITU Girls in ICT Portal at www.girlsinict.org.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Building workforce skills for a broadband-enabled knowledge-based economy

"In the 21st century, classification will be on the basis of information: societies with knowledge, and others without. Our region's success depends on creating an environment conducive to acquiring knowledge and on providing tomorrow's leaders with motivation to build a better future."
H.H. Sheikh Mohammed bin Rashid Al Maktoum

Many countries in the region have already acknowledged that creating a knowledge society is vitally important to the Arab region and have begun making investments in education, which will facilitate the region's transition to a knowledge society.

Moving forward, all countries in the region will seek to make investments in education and skills building at all levels. This will include:

- Ensuring that computer technology and digital literacy training is provided at the primary education level;
- The curricula of the secondary and tertiary educational systems is revised to build skills of young men and women in areas of:
  - Developing learners' abilities to collect, organize, sift, and analyze information
  - Leadership and management
  - Entrepreneurship and innovation

22 These ITU resources include the online ITU-G3ict e-Accessibility toolkit, the Connect a School, Connect a Community toolkit module on "Using ICTs to promote education and job training for persons with disabilities", and the BDT Thematic Reports on Making TV Accessible available on the Special Initiatives website. A report on Making Mobile Phones and Services Accessible will be published on the Special Initiatives website in 2012 at http://www.itu.int/ITU-D/sis/PwDs/index.phtml.

- Starting the building of capacity in education systems with skills development for teachers and school heads, accompanied by investment in R&D. Development of teaching resources can be directed at exploiting open standards, so that the market mechanisms for development of teaching aids are enabled to function as well as possible.
- Universities can seek to ensure that the courses they offer are constantly upgraded to ensure relevance to industry needs – this includes integrating science with other subjects; developing hands-on team-work and problem-solving teaching methods; bringing theoretical and practical modes of learning closer together through internships, mentoring and social networking and putting into place feedback loops enabling the private sector to advise schools, colleges and academic institutions on the skills and courses required to better meet industry needs.
- Universities themselves can develop their institutional capacity by working in partnership with other universities as is widely practiced in a growing number of Gulf countries where universities have developed partnerships with premier universities and research organizations.

5.2 Recommendations on ICTs to Respond to the Special Needs of Persons with Disabilities and Women

ICTs can be used for the social and economic development of persons with disabilities, women and for people living in rural and remote areas. This can be achieved through the following measures:

- Connect all schools to broadband networks.
- Equip schools with low cost computing devices and insure availability to all, including accessible and assistive technologies to ensure that children with disabilities receive an inclusive education.
- Leverage connected schools as community ICT centres addressing the social and economic needs of persons with disabilities, women and people living in rural and remote areas.
- Develop online Arabic literacy training materials to provide literacy training for women that can be distributed free of cost to governments and NGOs committed to providing literacy training for women[23].
- Encourage mobile operators in the region to develop post-literacy training for women delivered over mobile phones.
- Complement language literacy training with digital literacy training that teaches ICT basics and how to use ICTs to support and enhance women's ongoing economic activity[24] in line with the ITU-telecentre.org Digital Literacy Campaign to train one million women to become digitally literate by year end 2012[25].
- Develop policies and practices that promote accessible ICTs for persons with disabilities, including accessible TV and mobile phones and services; these practices can include, e.g. mobile operators buying bulk screen reader licenses and making them available for free for blind customers or developing open source versions of screen readers in Arabic.
- Ensure that more women and girls are encouraged to enter the ICT sector, including by organizing Girls in ICT Days every year on the 4th Thursday of April in line with ITU Plenipotentiary Resolution 70 (Guadalajara 2010) and providing scholarship and internship opportunities to women in the ICT sector.

In addition to responding to the special needs of persons with disabilities and women, the measures above can also be seen as part of a more comprehensive strategy to stimulate demand for broadband services.

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[23] ITU, through initial funding provided by the Telecommunications Regulatory Authority, UAE, ALESCO and the Arab Women's Organization plan to develop such training materials, and actively seek sponsors and partners to complete this work.

[24] See www.connectaschool.org for training materials used in the Asia Pacific Region on using social networks and government agriculture sights.

[25] See http://www.itu.int/ITU-D/sis/Gender/digital_literacy.html

Annex 1
Access and Infrastructure: Summary

Vision:
Achieving completion of infrastructure and Universal Access and improving the Q.o.S by utilizing ICT through:

1. Roll-out of national broadband networks and services
2. Building workforce skills to prepare for broadband-enabled economy.
3. ICT applications and services to respond to the special needs of persons with disabilities, women and those living in rural or remote areas.
4. ICT applications and services to support initiatives that promote youth entrepreneurship
5. Transitioning to digital broadcasting to enable mobile TV and interactive multimedia services and applications.
6. Affordability of ICT services

Objectives/Targets:

1. Fixed penetration
2. Mobile penetration
3. Broadband user penetration
4. Internet user penetration
5. Bandwidth/Inhabitant Availability of USO Policy
6. Affordability for End Users (USO policy)
7. Household connectivity

(Refer to the Target Matrix Annex 2 for the figures 2011 and Forecast 2016)

Commitments:

1. Roll-out of national broadband networks and services, including establishing national Internet Exchange Point (IXPs)
2. Government facilitating investment for the roll-out of national networks
3. Government Reduction of taxation and importation fees
4. Identifying private sector/operators to invest / compete not only in profitable areas but also in rural areas
5. Financial institution with social commitment to finance infrastructure projects in non financially viable areas
6. Vendors of ICT equipment to be fair in pricing and cost of maintenance
7. Service providers and operators should reuse part of their profits for building networks where needed
8. Legislative and Regulatory commitment to ensure fair competition in the provision of infrastructure and services, including international gateway/s, and enable fast roll-out
9. Governments to facilitate rights of way at cost oriented prices
10. Develop policies and practice that promote accessible ICTs for persons with special needs
11. Ensure the right to access ICTs services to all citizens, including in schools and community ICT centres
12. Develop harmonized national and regional frequency allocation table (NFAT and RFAT)
13. Stop transmission of analogue television broadcasting (analogue switch off, ASO) and have digital television service through the region
14. Promote and encourage Public, and Private Capital Investment
15. Elevate ICT contribution to GDP
16. Create conditions for more than one International Gateway
17. Governments facilitating Migration to IP Based Networks

18. Governments facilitating Transition to IPV6
19. Governments facilitating Investment for deployment of National Networks

Annex 2 – Target Matrix

	Target	Indicator	Definition	2011*	Forecast 2016
1	Penetration of fixed telephone lines (Per 100 inhabitants)	(i112) Fixed telephone subscriptions	Fixed-telephone subscriptions refers to the sum of active number of analogue fixed-telephone lines, voice-over-IP (VoIP) subscriptions, fixed wireless local loop (WLL) subscriptions, ISDN voice-channel equivalents and fixed public payphones. This indicator was previously called *Main telephone lines in operation*.	9.70%	9.74%
2	Penetration of mobile-cellular telephone subscriptions (Per 100 inhabitants)	(i271) Mobile-cellular telephone subscriptions	Mobile-cellular telephone subscriptions refer to the number of subscriptions to a public mobile-telephone service that provide access to the PSTN using cellular technology. The indicator applies to all mobile-cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.	96.70%	116.14%

3	Penetration of total broadband subscriptions (Per 100 inhabitants)	(i4213tfb) Fixed (wired)-broadband subscriptions	Refers to subscriptions to high-speed access to the public Internet , at downstream speeds equal to, or greater than, 256 Kbit/s. This includes cable modem, DSL, fibre-to-the-home/building and other fixed (wired)-broadband Internet subscriptions. It excludes fixed Internet access at speeds less than 256 Kbit/s, and fixed wireless broadband subscriptions.	2.20%	2.96%
		(i271tmw) Active mobile-broadband subscriptions	Active mobile-broadband subscriptions refers to the sum of standard mobile-broadband and dedicated mobile broadband subscriptions to the public Internet. It covers actual subscribers, not potential subscribers, even though the latter may have broadband enabled-handsets. It can be further broken down into S*tandard mobile-broadband subscriptions* and *Dedicated mobile-broadband subscriptions.*	13.30%	21%
4	Number of Internet users (Per 100 inhabitants)	(HH7) Estimated internet users	An Internet user refers to a person who used the Internet in the previous 12 months from any location. The Internet is a worldwide public computer network. It provides access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files.	29.10%	50% in developing countries and 15% in LDCs.*****

5	International Internet bandwidth (bit/s/capita)	(i4214) International Internet bandwidth, in bit/s	International Internet bandwidth/user, refers to the total used capacity of international Internet bandwidth/user, in megabits per second (Mbit/s). It is measured as the sum of used capacity of all Internet exchanges (locations where Internet traffic is exchanged) offering international bandwidth divided by number of internet users. If capacity is asymmetric (i.e. more incoming (downlink) than outgoing (uplink) capacity), then the incoming (downlink) capacity should be provided. This indicator is obtained by dividing the Internet bandwidth by the number of Internet users.	11,310 bit/s/user year 2010**	145220 bits/s/user
6	Availability of USO Policy	Availability of published Universal Service Policy, that defines a clear notional service availability		**7**	**All Arab Countries by 2015*****
7	Affordability of broadband: Price of fixed-broadband tariffs as % of monthly Gross National Income (GNI) per capita	ITU fixed-broadband sub-basket	Cost of entry level fixed-broadband service as defined by the ITU fixed-broadband sub-basket, calculated as % of monthly GNI per capita	52.6 % **	5 % by 2015****

8	Household connectivity	(HH 6)Proportion of households with Internet access at home	The proportion of households with Internet access at home is calculated by dividing the number of in-scope households with Internet access by the total number of in-scope households. It refers to access to (not use of) the Internet at home by in-scope households. The Internet is a worldwide public computer network. It provides access to a number of communication services includingthe World Wide Web and carries e-mail, news, entertainment and data files.***	26.10%	40 % by 2015 *****

** ITU Estimates*

Source: © INTERNATIONAL TELECOMMUNICATION UNION, 2011.

http://www.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom.html

Regions in this table are based on the ITU BDT Regions, see:

http://www.itu.int/ITU-D/ict/definitions/regions/index.html

Updated on 13 January 2012.

http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-PDF-E.pdf

****MIS report are available at:**

http://www.itu.int/ITU-D/ict/publications/hb/2011/index.html

http://www.itu.int/ITU-D/ict/publications/idi/2011/index.html

***Source: ITU Household Manual, page 20 (indicator name: HH6):

http://www.itu.int/ITU-D/ict/publications/hhmanual/2009/index.html

**** See World Telecommunication/ICT Development Report 2010, Chart 2.5 at:

http://www.itu.int/ITU-D/ict/publications/wtdr_10/material/WTDR2010_e_v1.pdf

showing 2008-2009 rates for selected countries as collected by UNESCO Institute for Statistics.

*****Broadband Commission:

http://www.broadbandcommission.org/Documents/Broadband_Targets.pdf