

# Mashreq 2.0: Digital Transformation for Inclusive Growth and Jobs



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# Executive Summary

**Digital transformation of the Mashreq economies presents a unique opportunity at this critical juncture to help address the Region's most imminent challenges.** Many emerging countries, including rising leaders such as Estonia in Eastern Europe or Chile in Latin America, have chosen the digital path and are driving rapid digital transformation of their economic activities, industrial sectors, and trade relationships. This growth in the digital economy stems from the growth in the billions of online transactions that businesses, individuals, and governments perform every day, which bring about efficiencies and quicker inclusion of lagging economic and social groups and improve governance and transparency, among other results. A new and different kind of economic growth is thus shaping the present and the future of global economic activities. Recognizing the importance of digital transformation, the World Bank President Mr. Jim Yong Kim during the World Bank Annual Meetings held in Bali in October 2018 announced the target of doubling Internet penetration in the Arabic countries by the time of the Annual Meetings to be held in Marrakesh in October 2021. This plan is also referred to as the “Moonshot Approach” and is articulated in the World Bank’s *Middle East and North Africa Economic Monitor: A New Economy for the Middle East and North Africa* (Arezki et al., 2018a). Disruptive technologies are also increasingly changing the business model of core sectors of the economy, including electricity, oil and gas, and industry production, and legacy systems will soon be antiquated, carrying the risk that countries that do not embrace digital transformation will continue to invest in “stranded assets”. The Mashreq countries **must** therefore catch up in strengthening their digital economy ecosystems and reposition themselves as strong economic competitors at the regional as well as interregional level. Building the ecosystem of a regional digital economy would greatly benefit from two main comparative advantages the region’s countries enjoy: a high level of education, including digital literacy, and a strategic position that allows them to be at the center of advanced services, trade, and connectivity.

**The Mashreq countries are witnessing several social and economic challenges as well as the impact of conflicts, all of which are stalling, if not reversing, the path to sustainable economic growth and inclusive societies.** Many national priorities are common across countries and are highlighted in several World Bank strategies and partnership frameworks for the Mashreq region. These include: creating jobs, improving service delivery and thus transparency and accountability, supporting the economic and social development of refugees and improving their ability to return home and integrate in the economic and social fabric of their countries and the region, and finally boosting inclusion in lagging areas and for vulnerable populations.

**Digital infrastructure is the foundational element of the digital economy and thus essential to any such transformation and leapfrogging.** Therefore, this report should be taken as a first assessment of a key foundational element for the digital economy and can be complemented by future assessments of digital entrepreneurship and skills, digital payments, and digital government as key elements of the enabling environment for the digital economy. For the “Moonshot Approach” to be implemented, the following actions will need to be undertaken, to “make markets work”, while complementing markets with proactive public investment to address market failure. Specifically, the World Bank’s *Middle East and North Africa Economic Monitor: A New Economy for the Middle East and North Africa* advocates: (i) deepening competition; (ii) eliminating rents; (iii) creating regulatory incentives, including a Fiber

Regulatory Package (FRP) to help operators invest in fiber optics and ensure universal access in broadband through proactive use of public sector subsidies (Arezki et al., 2018a). Broadband infrastructure enables economic growth by providing easier access to information and by increasing efficiencies and productivity in the economy. The underlying broadband infrastructure has direct impact on jobs, efficiency, and an inclusive economic growth.

**The Mashreq countries must fully leverage digital infrastructure as well as their relative strengths in transforming their economies.** The report lays out the strategic importance of digital infrastructure for countries in the region, takes stock of its status, and provides recommendations. Countries studied are: Iraq, Jordan, Lebanon, Iran, and Syria.<sup>1</sup> Digital infrastructure covers the broadband value chain: international connectivity, Internet exchange points (IXPs), backbone networks, and access networks. It identifies the main elements of broadband networks in the Mashreq, assesses the potential of data centers and regional IXPs, and provides benchmarks on key sector indicators for the region.

**This assessment concludes that:**

- Lebanon and Jordan are leaders in the use and adoption of mobile and fixed broadband services, and Iran has a comparatively high broadband penetration rate. Yet overall, there remains a considerable gap in the adoption, speed, usage and affordability of fixed broadband services between the Region and emerging economies such as Turkey, Romania, and Bulgaria, countries that compare positively in digital economy development. Lack of competition at the access level in the fixed broadband market is a constraint to broadband diffusion in all countries, except for Jordan. Syria, which is currently in conflict, has seen development of its broadband sector negatively impacted by physical destruction, but also more importantly by a slowdown of sector reform since the beginning of the hostilities. Competition and PPPs can drive access further in Iraq and Lebanon. Syria and Iraq will need a slightly adjusted approach: removing entry barriers and making markets work, including through PPPs, will still be a major objective. However, the implementation of the approach will need to be integrated into reconstruction and post-conflict efforts.
- The Mashreq has an extensive regional and backbone broadband infrastructure in place, but it is sub-optimally used, due to a mix of war and instability, complex political economy, and lack of reform at the domestic level. National backbone networks in the Mashreq countries are mostly managed and operated by incumbent SoEs. The Mashreq region has a strategic geographic position with respect to the global Internet infrastructure. Major regional backbone networks exist and have the potential to impact that infrastructure but are hampered by the conflict and violence in the region. The Mashreq countries could capitalize on the strategic access to major sea cable links through further liberalization of international gateways and IXPs.
- IXPs, public and private digital platforms, and data centers are less developed in the region. There is only one functional data center in the region, Beirut Internet Exchange, with other centers attempting to play this role. Iraq, Syria, and Jordan have no IXPs and Iran has four. The data center industry is nascent but has ample room for robust growth in the future.

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<sup>1</sup> The World Bank has active programs in Iraq, Jordan, and Lebanon. This report includes data available to the extent possible on Syria and Iran.



- Private sector digital platforms (also called multi-sided platforms, MSPs), are booming throughout the Arab countries of the Mashreq and in Iran, reflecting a growing willingness of consumers to engage in e-commerce and digital transactions, and despite some foundational bottlenecks. MSPs will be a fundamental driver of the transformation of the economies in the region.

**Key constraints in the region are: war and instability, political economies of reform, market concentration and continued dominance of state-owned enterprises (SoEs), and political isolation:**

- The political economy of reforms and the specificities of each country, as well as fiscal pressures and conflict and instability, are greatly affecting sector development. The implementation of reforms is complex and may require innovative ways of introducing competition and of balancing between these challenges and boosting growth of the digital infrastructure market through private sector investment and participation.
- The Middle East and North African (MENA) countries, including the Mashreq countries, have the most concentrated broadband market in the world. (This is particularly the case in the backbone and international connectivity segments of the value chain.) In addition, in these countries the monopoly is exploited either directly by the Government (e.g., Ministry of Telecommunications in Lebanon) or through state-owned enterprises (SoEs) (e.g., Iraq and Syria). These SoEs represent a considerable drag on sector development.

The second part of the report looks in detail at the importance of regional digital infrastructure for key sectors of the Mashreq economy, relates digital infrastructure to the overall development program of the Mashreq, and presents emerging research in private sector digital platforms in the region. It concludes that there is a substantial cross-infrastructure agenda both at the national, but more importantly, at the regional level, as energy and transport networks can be effectively used to expand broadband access in the region both across and within countries. The report presents several opportunities for the Mashreq governments to take advantage of and improve their digital infrastructure and the verticals that build on it. The report also highlights the opportunity to develop regional digital services for trade diversification, growth, and economic integration as a foundation for the emergence of a digital economy. Finally, the report stresses the importance of digital transformation, highlighting opportunities in key sectors, including health, education, urban development, and social services for migrant communities.

The following implementation roadmap can be envisaged for Iraq, Lebanon and Jordan, and at a Mashreq regional level. Iraq, Jordan and Lebanon should adopt “Moonshot” targets as part of their sector development strategies and, in particular:

- Double broadband access by 2021 and;
- Achieve complete broadband coverage by 2030.

To achieve these targets, the countries in the region will need to undertake reforms and actions at the national and regional levels.

Specific reform actions for **Iraq**:

- Remove the restrictions on the private operators to build, own, and operate domestic and international fiber infrastructure, and specifically, allow licensed telecommunications operators to reach the final customer with any technology, including fiber to the home (FTTH); allow mobile operators to build fiber backhaul networks.

- Enact a telecommunications legislation that lays the groundwork for increasing competition and private sector participation.
- Stimulate wholesale broadband investment to develop the broadband wholesale infrastructure to be used by private operators and Iraq Telecommunication and Post Company (ITPC) to deliver high speed access;
- Develop Iraq as a hub for international connectivity, by liberalizing the international broadband market segment, allowing for multiple landing stations and a “carrier hotel” model, and fostering IXPs.
- Reinforce the regulatory authority capacity.

For **Lebanon**, the implementation roadmap includes:

- A unified vision for the information and communications technologies (ICT) sector and a clear consensus on Government policy.
- The enactment of a harmonized license framework for digital service providers (DSPs).
- Reforming the fiscal transparency and management of the sector.
- Introducing competition in the sector and increasing private sector participation by making sure that all DSPs have a common legal framework to expand broadband access through fiber.
- Considering the restructuring of the mobile broadband sector by awarding fifth generation mobile (5G) licenses; and introducing private investment in the mobile sector by transforming Mobile Interim Company 1 (MIC1) and Mobile Interim Company 2 (MIC2) into operations that can be licensed to the private sector through an open tender process.
- Re-empowering the sector regulator and modernizing the legal and regulatory framework.

For **Jordan**, the implementation roadmap agenda includes:

- Introducing next generation public-private partnerships (PPPs), which emphasize a “risk sharing” (as opposed to “risk shifting”) approach,<sup>2</sup> to stimulate high speed Internet access beyond the main cities and urban centers by leveraging the existing national broadband network (NBN).
- Developing a White Paper for 5G Networks and awarding frequencies for 5G operators.
- Strengthening the regulatory framework and reviewing overall taxation and fees in the sector to stimulate investment and ensure appropriate regulatory oversight.
- Introducing next generation digital infrastructure including Internet of Things (IoT), cloud, and artificial intelligence and accompanying the digital transformation of the broadband, electricity, and transport sectors by leveraging that infrastructure.

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<sup>2</sup> Governing Institute. 2016. Issues Brief: “How Next-Generation Public-Private Partnerships Help Governments Share the Risk of Infrastructure Investment.” Available at: <http://www.governing.com/papers/How-Next-Generation-Public-Private-Partnerships-Help-Government-Share-the-Risks-of-Infrastructure-Investment-8667.html>.

At the **regional level**, the following implementation map is recommended:

- On the basis of this report, assess opportunities for regional integration of broadband networks by leveraging existing assets and networks, including terrestrial and submarine backbone networks, and leveraging the cross-national fiber assets of the utilities.
- Convene a regional workshop with the aim of agreeing on a common action plan to strengthen regional connectivity in the Mashreq and positioning the region as a digital hub at three different levels: (i) Internet connectivity; (ii) data hosting and cloud; and (iii) export of business process outsourcing (BPO)/information technology outsourcing (ITO)/knowledge process outsourcing (KPO) and digital services to the rest of the world.
- Leverage existing World Bank instruments and donor partners to design and implement an investment and advisory program on international broadband connectivity at the regional level.

The development of physical access networks (“last mile” access) will be the area where most policy attention will need to be paid and the area which could attract the largest amount of investment. The level of investment needed to bring high speed broadband access to 30% of the population of the Mashreq through fiber access (about 13 million households) will be between **US\$4.0 - 5.2 billion**. The development of IXPs (beyond the two operating in Lebanon and the four in Iran) is also a major priority and could be in the range of US\$200 million.

Several multi-disciplinary, lending, and advisory service programs can therefore be formulated to support the Mashreq governments in developing their digital infrastructure markets in order to foster their digital transformation. These include programs for facilitating trade, in the energy sector, for financial inclusion, for the rebuilding of damaged cities such as Mosul, and for improving governance and public services.

The Mashreq countries can benefit from broader assessments of their economies’ readiness for digital transformation. The Digital Economy Country Assessment (DECA) and Digital Economy for Africa (DE4A) framework has been developed for this purpose. Multi-disciplinary teams are now supporting DECAs in several countries in Africa (starting with Senegal) and Europe and Central Asia (Russia, Armenia, Kazakhstan). These assessments survey the essential components of the digital economy in a specific country (institutions, governance, digital skills, private and public platforms, entrepreneurship, digital finances and innovation) and recommend policy interventions and actions that could greatly improve the socioeconomic impact of the transformation to a digital economy. The team proposes to conduct this type of assessment for the Mashreq countries, at national levels as well as at a regional level. Assessment of common bottlenecks and opportunities would greatly improve the integration effort and strengthen the regional competitiveness of the Mashreq countries.

## World Bank Operational and Advisory Intervention in support of Mashreq 2.0

	World Bank Instrument	Area of Engagement	Instrument
<b>Lebanon</b>	Lebanon National Jobs Program P4R	Broadband Infrastructure, Digital Entrepreneurship	Lending - P4R SPN
	Lebanon Digital Economy Project	Digital Government, Digital Economy	Lending - tbd
	Capital Investment Plan Review	Broadband, Cloud, Security, Digital Government, Cross-Infrastructure	Analytical and Advisory
<b>Jordan</b>	Broadband NGN PPP Technical Assistance	Broadband Infrastructure	Analytical and Advisory
	Youth, Technology and Jobs Operation		Lending - IPF
	Equitable Growth and Job Creation	Broadband Sector Reform, Next Generation Networks, Digital Financial Services	Lending - DPO
<b>Syria</b>	Syria Dynamic Needs Assessment (DNA)	Broadband Infrastructure	Analytical and Advisory
<b>Iraq</b>	Digital Economy Project	Broadband, Digital Platforms, Digital Finance and Entrepreneurship	Lending (specific instrument to be determined)
	RAS on Regulatory Capacity Building	Broadband Networks, regulatory support	Analytical and Advisory
<b>Regional Strategy and Integration</b>	The New Levant	Regional Integration, Broadband Internet, Entrepreneurship and Innovation	Analytical and Advisory
	Skilling Up Mashreq Initiative (SUM)	Digital Skills	Analytical and Advisory, Convening power
	MENA Monitoring Report. The New Economy	Digital Economy, Regional Broadband Networks	Analytical and Advisory
	The Digital Economy in the MENA Region	Digital Economy	Analytical and Advisory



# I. Digital Infrastructure: Why it Matters to the Mashreq

## A. Mashreq strategies

**The Mashreq countries are witnessing several social and economic challenges that are stalling, if not reversing, the path to sustainable economic growth and inclusive societies.** For instance, the World Bank's Middle East and North Africa economic monitoring report for April 2018 argues that geopolitical tensions, forcibly displaced people (including refugees), and rising levels of unemployment and debt in the region could cloud the positive economic growth outlook expected in the region for 2018 and beyond. This is compounded by high unemployment rates among youth and refugees, reducing their chances to fully integrate in the national, regional, and global economies and thus affecting the political stability in the region.<sup>3</sup>

**Digital transformation and its underlying digital infrastructure can greatly help Mashreq countries in addressing their most imminent challenges.** Reliable and future-proof digital infrastructure is the foundation for the digital transformation of the Mashreq's economies and thus their path to a more inclusive and sustainable growth. Data and information flows, now generating more economic value than trade in global goods, rely first and foremost on long-lasting digital infrastructure that can cater to the growing need for speed and bandwidth for individual, business, and government usage. Broadband infrastructure enables economic growth by providing easier access to information and by increasing efficiencies and productivity in the economy. The underlying broadband infrastructure has a **direct impact on jobs, efficiency, and an inclusive economic growth.**

**The following national priorities are common across many countries and are highlighted in many World Bank strategies and partnership frameworks for the Mashreq region.** These include: creating jobs, improving service delivery and thus transparency and accountability, supporting the economic and social development of refugees and improving their ability to return home and integrate into the economic and social fabric of their countries and the region, and finally boosting inclusion in lagging areas and for vulnerable populations. In particular, a common regional approach to skills development, venture capital development, technology and entrepreneurship services, incubation, and infrastructure has been highlighted in previous analytical work done in the region. For example, this type of approach was also highlighted in the previous report *Over the Horizon: A New Levant* (World Bank, 2014), which specifically mentions the importance of a common digital infrastructure to increase the region's access to larger markets such as Turkey, the European Union, and Africa.

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<sup>3</sup> Arezki, Rabah, Lili Mottaghi, Andrea Barone, Rachel Yuting Fan, Youssouf Kiendrebeogo, and Daniel Lederman. 2018b. *Middle East and North Africa Economic Monitor: Economic Transformation*. April. Washington, DC: The World Bank.  
<https://www.worldbank.org/en/region/mena/publication/mena-economic-monitor-april-2018-economic-transformation>.

In addition:

- Over the coming years the World Bank's strategy in the Mashreq region will focus on: (i) promoting inclusive economic growth and job creation, (ii) financing climate-smart infrastructure, (iii) scaling up access to and quality of service delivery, and (iv) mitigating the economic and social impact of recent and ongoing crises in the region to safeguard development gains and promote peace and stability.
- The most recent World Bank MENA Strategy, entitled Economic and Social Inclusion for Peace and Stability in the Middle East and North Africa: A New Strategy for the World Bank Group, is focused on four pillars: (i) renewing the social contract; (ii) resilience to shocks; (iii) regional cooperation; and (iv) recovery and reconstruction.<sup>4</sup>

**Specific priority areas of focus for World Bank assistance have also been developed more recently for Lebanon and Iraq and include an important component of reinforcing digital infrastructure.**

- Following the liberation of all Iraqi territory from the Islamic State of Iraq and Syria (ISIS) jihadist group in December 2017, the Government of Iraq (GoI) has been putting in place a comprehensive reconstruction package linking immediate stabilization to a long-term vision: from war to reconstruction and economic recovery. The GoI's reconstruction and development framework presented at the International Conference for Reconstruction of Iraq held in Kuwait in February 2018 addresses recovery needs and priorities according to five key pillars: (i) governance, (ii) national reconciliation and peacebuilding, (iii) social and human development, (iv) infrastructure, and (v) economic development. Focus is also given to creating jobs, promoting social cohesion, improving access to basic services, increasing short-term employment in targeted areas, and facilitating the stabilization of returnees. Following the conference, the GoI adopted a set of reform plans, in which the highest priority is improving connectivity and the reduction of Internet service prices as a short-term action. The new Country Partnership Framework (CPF) for Iraq also focuses on rebuilding the trust between the state and the citizens, along with a private sector and Maximizing Finance for Development (MFD) approach, all of which can greatly leverage a solid enabling environment and higher investment in digital infrastructure.
- In Lebanon, the CPF for the years 2017-2020 and the Government's 2018 Capital Investment Program highlighted several important areas that the Lebanese government has to focus on in the next years including: (i) improving livelihoods and job creation; (ii) improved services; (iii) increased role of the private sector in job creation and service delivery; and (v) helping to alleviate fiscal pressure through five themes: training, education, employability, service delivery, and microfinance. Under this umbrella, the World Bank's Digital Development team is working across different sectors and projects to improve the digital infrastructure of the country through enabling efficient and increased private sector investment and improving government service delivery.

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<sup>4</sup> World Bank. 2015. *Economic and Social Inclusion for Peace and Stability in the Middle East and North Africa: A New Strategy for the World Bank Group*. <https://worldbankgroup.sharepoint.com/sites/MNA/Pages/SitePages/RegionalStrategy.aspx> and <http://www.worldbank.org/en/region/mena/brief/our-new-strategy>.

- At the level of the regional cooperation, the World Bank Group has committed its support to regional institutions, as well as investments and trade, including through financing and de-risking, as well as promoting transboundary and subregional cooperation. Regional cooperation on the development of digital infrastructure can be key to achieving more regional and trade integration.

**The Mashreq countries still need to fully leverage digital transformation, and as a priority, they can focus on the transformation of the services sector as one of the highest impact quick wins that can build on many comparative advantages that the countries have.** The MENA countries, including the Mashreq countries, are the least integrated into the global economy, and their biggest gap with fast-growing ones is the performance of the services sector. Companies that embrace digital transformation will have the highest productivity and profitability increases, and SMEs using digital technologies will accelerate growth. Digital infrastructure can thus be leveraged to foster the development of the services sector, its diversification, and the development of regional and international trade in services. Against this background, promoting the digitization of services is a promising way to create jobs, diversify the economies, and reach a higher level of economic growth. The Governments in the Mashreq should therefore embrace the reforms that can transform their economies and social programs through digital development. **The Mashreq countries have many advantages to leverage in bringing about the digital transformation of their services sectors,** including a strategic geographic position, the high education level of university graduates, a multilingual population, and the high penetration of social media and smartphones.

## B. Impact of digital infrastructure

If the countries in the Mashreq introduce effective sector reform in the digital infrastructure sector, strengthening regional data connectivity, many benefits can potentially arise. The transformation in the services sector and the development of digital strategies would have important implication for:

- **Trade development and diversification:** There is positive evidence that Internet development has increased exports in middle-income countries;<sup>5</sup> by developing exports of services and service-intensive goods, the Mashreq countries can also move away from natural resource-intensive exports, promoting trade diversification.
- **Improving firm productivity:** Digital transformation has a positive effect on competitiveness of the countries' economies, through its impact on productivity and firm profitability. Companies adopting digital technologies are 26% more profitable than their industry peers.<sup>6</sup>

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<sup>5</sup> Clarke, George R.G. 2008. "Has the Internet Increased Exports for Firms from Low and Middle-Income Countries?" *Information Economics and Policy*, Elsevier, Vol. 20, No. 1, March, pp. 16-37. <https://ideas.repec.org/a/eee/iepoli/v20y2008i1p16-37.html>.

<sup>6</sup> Westerman, George., Maël Tannou, Didier Bonnet, Patrick Ferraris, and Andrew McAfee. 2013. "The Digital Advantage: How digital leaders outperform their peers in every industry" (Cagemini Consulting and MIT Center for Digital Business), p. 7. Available at: <http://ide.mit.edu/news-blog/blog/digitally-mature-firms-are-26-more-profitable-their-peers>

- Promoting private sector-led growth: The digital economy worldwide was 15.5% of global gross domestic product (GDP) in 2016 and was projected to grow up to 24.3% by 2025;<sup>7</sup> this could allow the Mashreq countries to increase their economic growth and diversify their economies away from natural resources.
- Job creation: Although the overall impact of digitization on employment is uncertain, a recent study finds that employment growth in high tech jobs outpaced gains in other professions by a ratio of 27 to 1 between 2001 and 2011. In addition, demand for high tech jobs will exceed demand for any other profession. Digital jobs have also a high job multiplier effect.<sup>8</sup>
- Improving and facilitating service delivery, including to refugees and host communities. Digital infrastructure enables important services such as e-health, e-education, energy payments, and financial inclusion, among others.

There is a consistent body of knowledge pointing out **that broadband development is associated with higher economic growth**. However, the estimate of its actual impact varies. The available studies demonstrate that a ten percent increase in broadband penetration is associated with an increase in economic growth by a range of 0.24 to 1.50 percentage points (Figure 1). Increasing broadband penetration in Lebanon could thus substantially increase its GDP growth. Applying the average of these estimates (0.85 to 1.16 percentage points) to the US\$35 billion Lebanese GDP in 2017 (World Development Indicators), might result in an additional contribution of US\$430 to US\$590 million to the GDP for each 10% increase in broadband penetration.<sup>9</sup>

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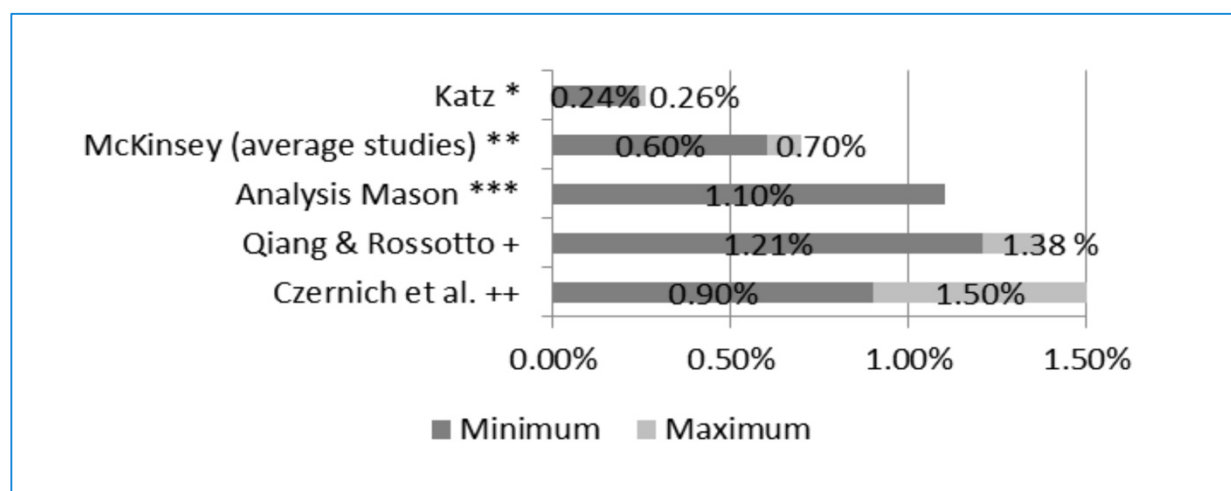
<sup>7</sup> Huawei Technologies Co. Ltd. and Oxford Economics. 2017. *Digital Spillover: Measuring the true impact of the Digital Economy*. Shenzhen: Huawei Technologies Co. Ltd., pages 2, 6, 8, 9, 29, 33, and 44. Available at: <https://www.huawei.com/minisite/gci/en/digital-spillover/index.html>.

<sup>8</sup> Cited in Arezkmi, Rabah, Lili Mottaghi, Andrea Barone, Rachel Yuting Fan, Youssouf Kiendrebeogo, and Danel Lederman. 2018a. *Middle East and North Africa Economic Monitor: Economic Transformation*, April, Washington, DC: The World Bank, p. 12. <http://documents.worldbank.org/curated/en/146731523302324108/pdf/replacement-PUBLIC-MENA-Economic-Monitor-April-2018-final-without-Jordan.pdf>.

<sup>9</sup> Range calculated by averaging minimum values and maximum values of the sample of estimates.



**Figure 1: Impact on GDP of an increase of 10% in broadband penetration**



Sources: Katz 2010; Analysis Mason 2010; McKinsey 2009; Qiang & Rossotto 2009, and; Czernich et al. 2011.<sup>10</sup>

**The development of broadband is associated with positive short-term effects on job creation; however, broadband's long-term employment effects are complex.** In the short to medium term, building or upgrading a broadband network creates:

- direct jobs to build the broadband infrastructure;
- indirect and induced jobs created from this activity; and
- additional jobs created because of broadband network externalities and spillovers.

Numerous studies have estimated the impact of broadband in each of these job creation categories for specific countries by calculating employment multipliers for each of the categories (Table 1). A simple average of these estimates applied as indication of potential broadband job creation results in 2.78 indirect and induced jobs and 1.17 spillover additional jobs created per direct broadband construction job created. **This means that broadband can create between 2.5 and 3 additional jobs per direct broadband employment. These results need to be taken with caution.** The impact on employment is complicated by the disruptive long-term impact of high speed Internet on entire sectors of the economy.

<sup>10</sup> **Notes:** \* Only includes Germany; \*\* Average of five country studies, including United Kingdom, Australia, New Zealand, Malaysia and a Middle Eastern country, from various sources 2003 and 2004, and Qiang and Rossotto 2009 study; \*\*\* Limited to mobile broadband impact in India; + Various countries, upper range applies to developing countries and lower range to developed countries; ++ Sample of 20 OECD countries.

**Table 1: Estimated broadband employment creation multipliers**

Study	Year	Scope	Type I	Type II	Network Effects
Crandall et al.	2003	US	...	2.17	...
Katz et al.	2008	Switzerland	1.4	...	...
Atkinson et al.	2009	US	...	3.60	1.17
Katz et al.	2009a	US	1.83	3.43	...
Liebenau et al.	2009	UK	...	2.76	...
Katz et al.	2009b	Germany	1.45	1.93	...
<b>Average</b>			<b>1.56</b>	<b>2.78</b>	<b>1.17</b>

Sources: Katz 2009, citing Crandall et al. (2003), Katz et al. (2008), Atkinson et al. (2009), Katz et al. (2009a), Liebenau et al. (2009) and Katz et al. (2009b).

**Note:** Type I (Direct + Indirect)/Direct; Type II (Direct + Indirect + Induced)/Direct

**In addition to broadband, the development of a cloud-based economy is also associated with employment gains.** For example, a research team at the London School of Economics in a study looking at Germany, the UK, Italy and USA, found an important employment effect related to the introduction of cloud services in key sectors of the economy and in industrial sectors. The same effect has been identified in the Turkish economy and can be relevant for the Mashreq. The development of a cloud-based, high speed digital infrastructure is particularly critical for the development of jobs in urban areas positioned to be service hubs. As London created a big data hub, 54,000 additional cloud specialists were added to the employment base, which also added 45,000 additional fintech specialists.<sup>11</sup> The example of London's big data hub can be studied for urban centers in the Mashreq such as Beirut, and to a lesser extent, Amman.

**The diversity of the Mashreq countries' workforce and the breadth of high-skilled human resources are a great opportunity to take advantage of broadband job creation potential.** Broadband provides employment opportunities for both the skilled and unskilled person. However, the potential to develop new services on intermediary sectors, such as e-banking or e-health, and complete new industries, such as export-oriented IT-enabled services, open the door for multiple new job opportunities for high-skill human resources. Moreover, the delocalization of global employment through crowd-sourcing is opening some job opportunities for those connected through broadband to these new platforms.

A well-developed, far-reaching digital infrastructure in the Mashreq, with its necessary skills and institutional complements, will be essential to ensure that different countries in the Mashreq do not

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<sup>11</sup> Liebenau, Jonathan, Patrik Kärrberg, Alexander Grous, and Daniel Castro. 2012. *Modelling the cloud: employment effects in two exemplary sectors in the United States, the United Kingdom, Germany and Italy*. London, UK: London School of Economics and Political Science, LSE Enterprise. <http://eprints.lse.ac.uk/41763/1/LSE-Cloud-report.pdf>. The study received partial funding from the Microsoft Corporation.

experience uneven growth patterns. Technology is seen as a driver for growth and productivity and is looked at closely as a factor to limit the risk of growing growth inequalities between countries and within countries. A recent World Bank report clearly identifies technological change as a strategic growth driver in Europe:

*“Technological change is driving a wedge in product and labor markets by providing immense opportunities for some firms and workers while leaving others behind. Jobs are becoming more cognitive- and less routine-task intensive [...]. This is making jobs more intensive in skills that complement technology (cognitive and social-emotional skills). Workers well-equipped with these skills (high-skill workers) are benefiting from these changes, while low-skill workers are losing the most. Thus, low-income Europeans are being left behind in the labor market because of their low skills, at a time when technological change and globalization are making jobs more skill intensive. On the firm side, frontier firms are benefiting the most from technological change and globalization. Productivity dispersion between firms is large and rising, as top firms are pulling away and bottom firms are falling behind.”<sup>12</sup>*

In addition to the impact of extending broadband on GDP and job creation, there is a growing body of evidence pointing to its impact on the creation of digital businesses and skills associated with the introduction of gigabit connectivity. For example, the case of Chattanooga, Tennessee, in the United States is well documented. Chattanooga became the first US city to roll out a citywide gigabit network in 2015. The network reaches a download speed of 10-15 gigabits per second today. The city government in Chattanooga has created a comprehensive plan to turn the city into the “Gig City” destination of entrepreneurs (providing high speed Internet, cloud, and data services at higher quality and higher speed than those provided in Silicon Valley). Today Chattanooga is experiencing a boom in entrepreneurship and its unemployment rate has dropped from a peak of 9.8% in May 2009 to a low of 3.3% in May 2018. The city has built a digital innovation district, facilitating digital business creation and supporting skill development programs at local universities.<sup>13</sup>

In the United States, broadband has been recently connected to a **non-negligible increase in employment among married women**. According to Dettling (2017), *“exogenously determined high speed Internet use leads to a 4.1 percentage point increase in labor force participation for married women. No corresponding effect is found for single women or men. Among married women, the largest increases in participation are found among college-educated women with children.”<sup>14</sup>* Even though it would not be suitable to extrapolate this result for the Mashreq’s women, given the socioeconomic differences between the countries, an increase of high speed Internet access does carry the promise to enhance women’s economic empowerment opportunities. Broadband diffusion has also been highlighted as an explanatory

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<sup>12</sup> Ridao-Cano, Cristobal, and Christian Bodewig. 2018. *Growing United: Upgrading Europe's Convergence Machine*. Washington, DC: The World Bank, pages 23, 59. <https://openknowledge.worldbank.org/handle/10986/29448>.

<sup>13</sup> Storrington, Nate, and Charlotte Benz. 2018. *Opportunities for Transformative Placemaking: Chattanooga Innovation District*, Tennessee. Washington, DC: Brookings Foundation. November. <https://www.brookings.edu/research/opportunities-for-transformative-placemaking-chattanooga-innovation-district-tennessee/>.

<sup>14</sup> Dettling, Lisa J. 2017. “Broadband in the Labor Market: The Impact of Residential High-Speed Internet on Married Women’s Labor Force Participation.” *ILR Review*, Vol. 70, No. 2, March, pp. 451-82. <https://doi.org/10.1177/0019793916644721>.

variable to interpret lower teen pregnancy rates, therefore enhancing learning and employability opportunities among women.<sup>15</sup>

Broadband also enhances public service delivery and the achievement of broad social goals. This provides many arguments for **an inclusive, broad-based development of broadband**. A limited development of broadband in certain areas of the country may seriously undermine the effectiveness of important social policies and programs. This is illustrated, among many examples, by using social media and big data in food safety programs, the use of gaming, computer, and Internet interaction for sexual education and HIV prevention, the use of online communities for health awareness programs, and broad-based rural empowerment programs. A limited or uneven deployment of broadband could exclude those very social groups that are the target beneficiary populations of government social programs.

A high unemployment rate, particularly among university graduates and skilled people, is one of the most important challenges faced by the Mashreq countries and is thus critical to address in order to prevent further unease and discontent among the youth and create more resilient and inclusive economies. Digital connectivity, particularly high-speed broadband networks and services, is the foundation for a modern digital economy and can help the Mashreq countries create more jobs, increase productivity, reduce the disparity between regions and social and economic groups, and spur inclusive economic growth. Iraq, Jordan, and Lebanon are at different stages of their digital infrastructure development and thus have different needs and goals to achieve. However, all countries have comparative advantages that they can leverage to leapfrog in the transformation of their economies. These include a highly skilled and multilingual population, a strategic geographic position, and high penetration of smartphones and mobile broadband usage. In this transformation, the services sector stands as the most promising one to rapidly benefit from the development of broadband networks and digital applications. The services sector in the region is among the least developed compared to emerging markets, yet it can leverage the human capital and skills resources of the region and in turn have high spillover effects on the rest of the economy. Governments in the region should therefore adopt digital strategies that focus, as a priority, on developing high speed broadband networks and services that target the most productive segments of the services sector and that connect existing and new labor market entrants to global markets.

Finally, the importance of digital infrastructure for refugees has been highlighted at the highest level. For example, the United Nations Broadband Commission for Sustainable Development, in its Open Statement, highlights the importance of broadband Internet access for refugees, summarizing the benefits in a compelling way: *“Internet access can play a crucial role for people undertaking difficult and traumatic journeys to safety, providing a potential lifeline to call for help, supplying up-to-date information on the security situation in their location, detailing how and where to access life-saving assistance and allowing them to inform relatives that they are safe. Once in their country of asylum, Internet connectivity can be a powerful tool for helping refugees to rebuild their lives. Broadband connectivity enables access to digital cash transfer programs and other digital financial services that can build financial resilience and support*

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<sup>15</sup> Guldi, Melanie and Chris M. Herbst. 2017. “Offline Effects of Online Connecting: The Impact of Broadband Diffusion on Teen Fertility Decisions.” *Journal of Population Economics*. Springer; European Society for Population Economics. Vol. 30, No. 1, January, pp. 69-91. [https://ideas.repec.org/a/spr/jopoec/v30y2017i1d10.1007\\_s00148-016-0605-0.html](https://ideas.repec.org/a/spr/jopoec/v30y2017i1d10.1007_s00148-016-0605-0.html).



*livelihood recovery. Both children and adults can take part in distance learning programs, allowing them to continue their education and further develop their skills for the workplace. Refugees are also better able to rely on themselves and to become more self-sustainable and lead more productive lives, improving their own economic prosperity.”<sup>16</sup>*

The experience of providing data infrastructure and services to refugee communities has been tested in many countries, and academically assessed in Katz and Berry (2014), which examines the initiative “Computer Gateways for Self-Sufficiency”, a partnership between the United Nations High Commissioner for Refugees (UNHCR) and corporate sponsors including Microsoft, PriceWaterhouse, and the Motorola Foundation.<sup>17</sup> The impact of extensive technology access in camps in Bangladesh and Rwanda on literacy and employability was documented and led to an expansion of the initial project to 31 centers in 13 countries.<sup>18</sup>

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<sup>16</sup> Broadband Commission for Sustainable Development. 2018. *Open Statement from the Broadband Commission for Sustainable Development: Broadband Connectivity for Refugees*.  
[http://www.broadbandcommission.org/Documents/BroadbandConnectivityOpenStatement\\_.pdf](http://www.broadbandcommission.org/Documents/BroadbandConnectivityOpenStatement_.pdf).

<sup>17</sup> Katz, Raul L. and Taylor A. Berry. 2014. *Driving Demand for Broadband Networks and Services*. New York: Springer International Publishing, p. 105.  
[https://books.google.com/books/about/Driving\\_Demand\\_for\\_Broadband\\_Networks\\_an.html?id=zvipoAEACAAJ](https://books.google.com/books/about/Driving_Demand_for_Broadband_Networks_an.html?id=zvipoAEACAAJ).

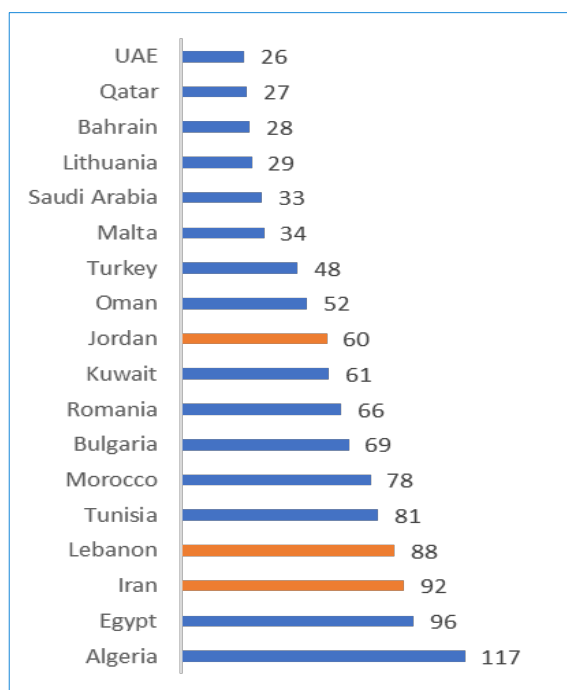
<sup>18</sup> Ionita, Daniela. 2011. “Community Technology Access Project.” *Forced Migration Review*. Issue 38. October 2011, p. 31.  
<https://www.fmreview.org/sites/fmr/files/FMRdownloads/en/technology.pdf>.

## II. How does the region compare in digital connectivity?

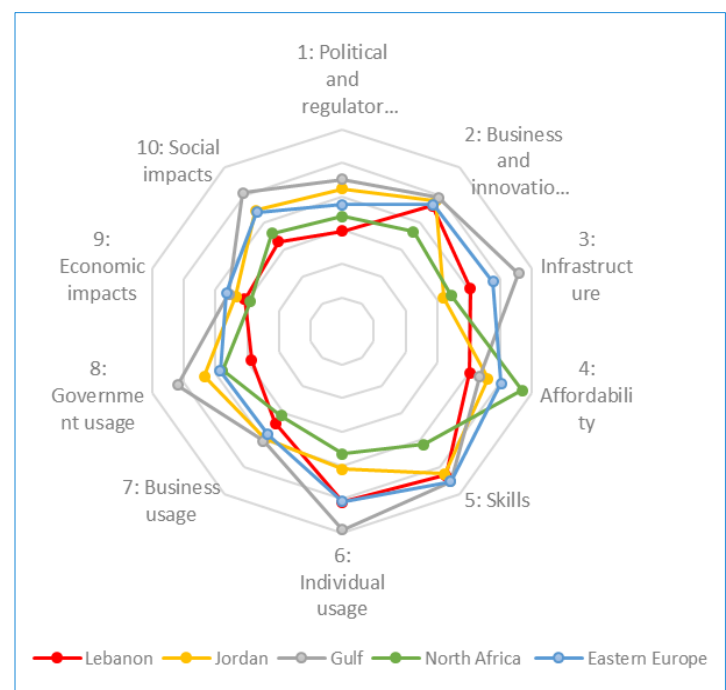
**In the Mashreq region, Jordan and Lebanon have been leaders in developing, adopting, and utilizing digital infrastructure and services.** Jordan, at rank 60 in the world on the World Economic Forum's Networked Readiness Index (NRI), is ahead of Lebanon (88) (NRI figures for Iraq and Syria are not available). The Gulf countries are markedly among the best performing in the world (Figure 2); however, other countries in the region such as Turkey and Morocco, as well as emerging markets such as Romania and Bulgaria, have also outperformed Lebanon in the overall readiness ranking.

**Lebanon and Jordan have different sets of weaknesses and opportunities in their network readiness ecosystem.** The major weaknesses in Lebanon are the political and regulatory environment and government usage. In contrast, Lebanon has a high comparative advantage in skills and business innovation. Jordan, has a different set of challenges and opportunities: the country has one of the lowest scores compared to peers in infrastructure (fixed broadband infrastructure) and individual usage (also fixed broadband services), and is one of the best in political and regulatory environment and government usage. For both countries, there is a considerable gap between individual usage and business and government usage (Figure 3).

**Figure 2: Networked Readiness Index**  
(Rank out of 143, 1= Best)



**Figure 3: Networked Readiness Pillars ranking**

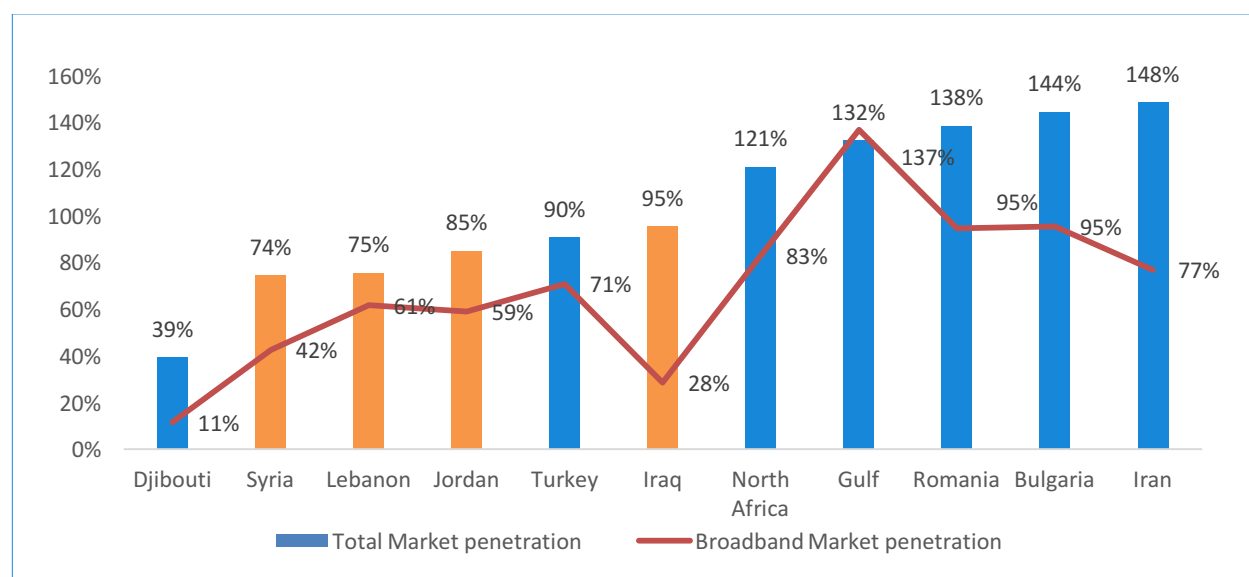


Sources: World Economic Forum, Networked Readiness Index 2016

Note: Iraq and Syria were not ranked in the 2016 NRI.

**Mobile broadband services are the most commonly used platforms in the Mashreq to access and use Internet and data services.** In 2017, mobile broadband subscriptions stood at 61% and 59% in Lebanon and Jordan respectively, followed by 42% in Syria, and 28% in Iraq. Data shows that there is a gap between the adoption of basic mobile services and mobile broadband services. Lebanon has the smallest difference between the two subscription levels, indicating that most mobile users are also users of mobile broadband services. This gap is much higher in all other countries and is the highest in Iraq. But even the best performers lag behind some regional peers, especially Eastern European and Gulf Cooperation Council (GCC) countries, with penetration rates above 90% for mobile broadband (Figure 4).

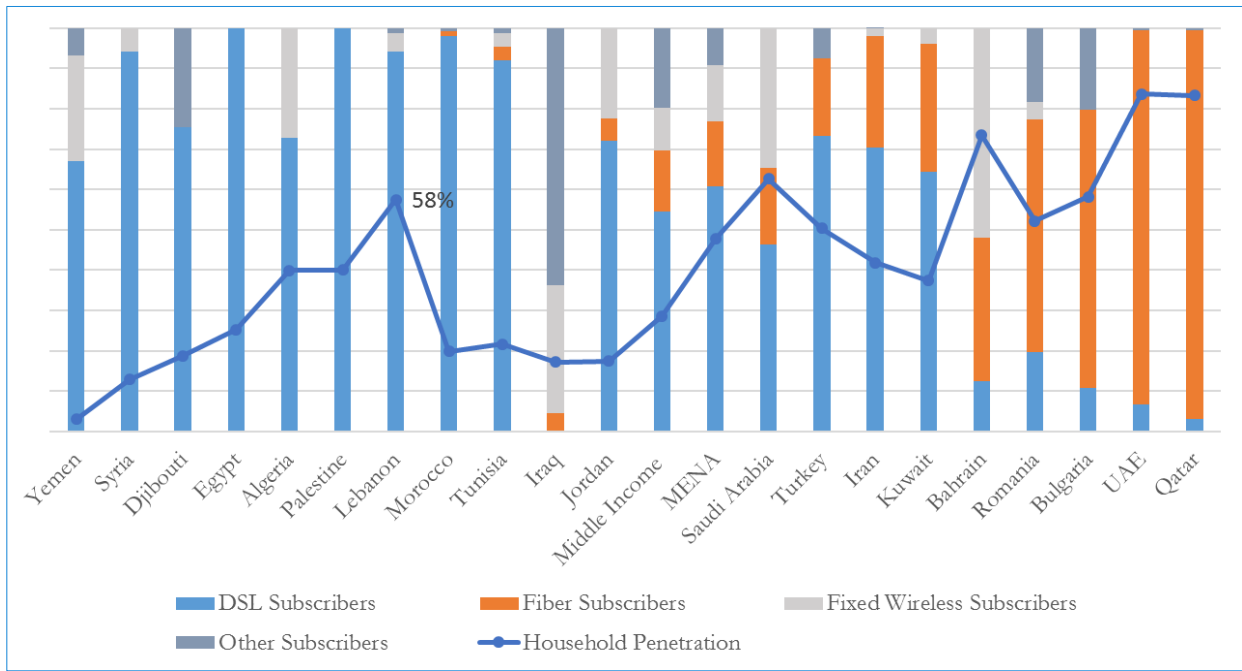
**Figure 4: Penetration of mobile and mobile broadband services (per 100 inhabitants)**



Source: GSMA Intelligence, 2018

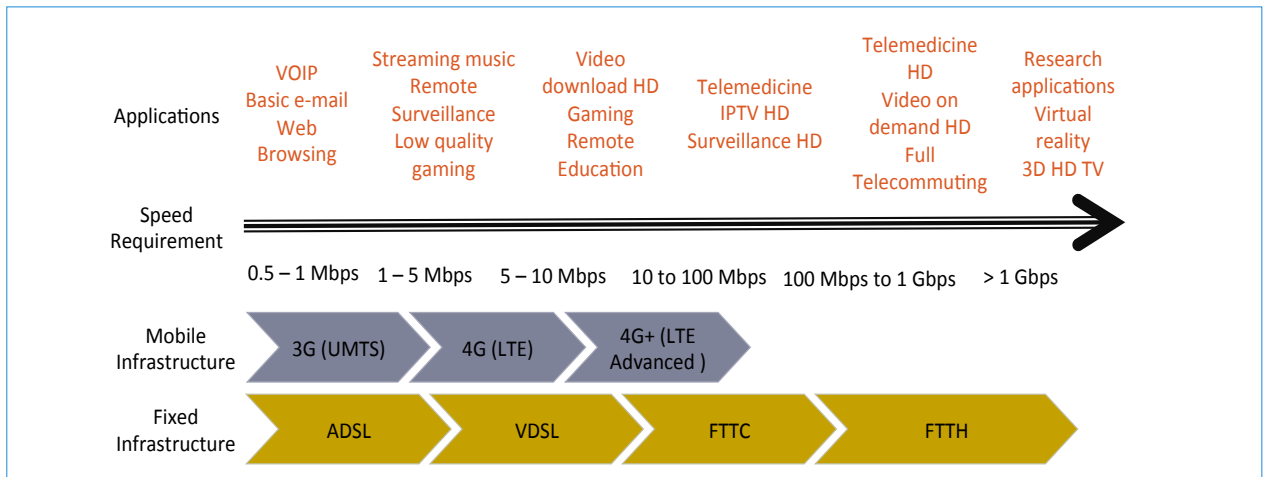
**The Mashreq countries exhibit a very low penetration of fiber-based access infrastructure, as most fixed broadband is based on asymmetric digital subscriber line (ADSL) and fixed wireless technologies.** Fiber infrastructure is the main data and Internet platform for innovation and the exchange of information and is at the core of the region's low performance in the digital technologies environment. Lebanon has the highest levels of overall fixed broadband penetration at 58% of households in 2017 and is higher than both middle income and MENA averages. Iraq and Jordan have fixed broadband penetration lower than the middle-income countries' and MENA countries' averages (Figure 5). Yet, the major difference between the region and the best performers, is the very low penetration of fiber infrastructure. Fixed infrastructure in the region is mostly based on the Digital Subscriber Line (DSL) or fixed wireless technologies that are limited in the service speeds and bandwidth it can deliver (Figure 5 and Figure 6). Jordan has the highest penetration of fiber subscribers at 6%, followed by a very negligible penetration in Iraq and Lebanon. In comparison, more than 50% of household connections in Romania and Bulgaria are based on fiber, and the percentage goes up to more than 90% for Qatar and the United Arab Emirates (UAE).

Figure 5: Distribution of Fixed Broadband subscriptions by technology



Source: TeleGeography, 2017

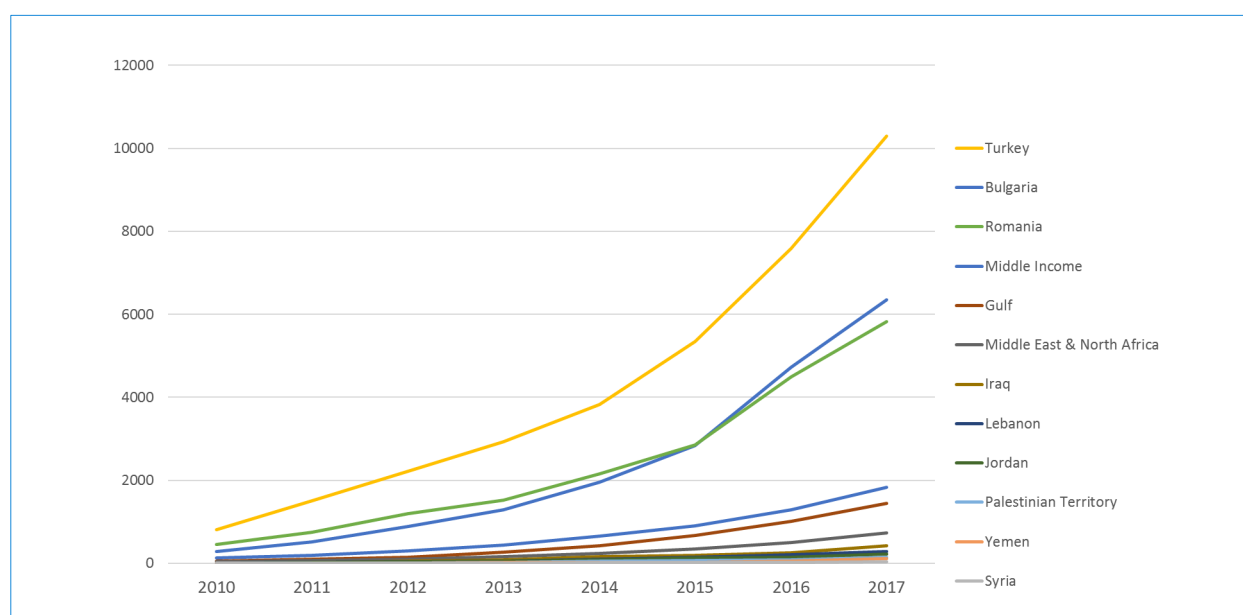
Figure 6: Broadband speed requirement by application



Source: Authors

**The low level of fixed broadband penetration and specifically of fiber infrastructure is correlated with low levels of international bandwidth used.** Jordan, Iran and Lebanon have very low levels of international bandwidth per capita compared to peers. Moreover, the growth in international bandwidth has widened between the region and best performers such as Turkey, Romania, and the middle-income countries' average since 2010 (Figure 7). This indicates that although the number of users has been increasing, their bandwidth usage level is not growing as fast as those countries with a higher overall readiness environment.

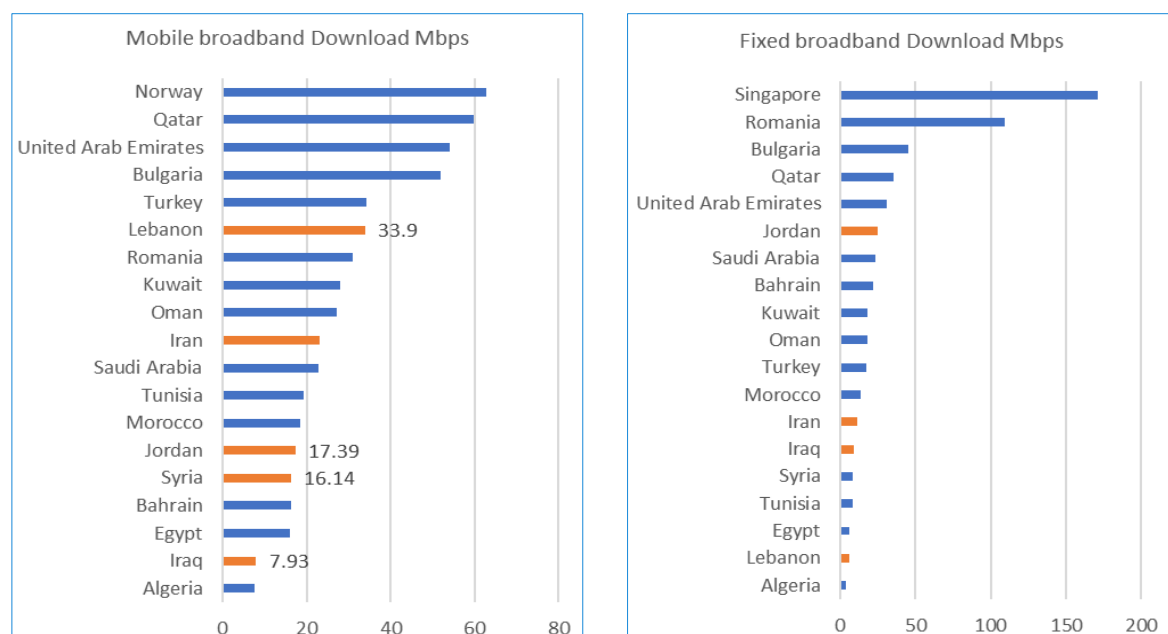
**Figure 7: International used bandwidth trends, (Gigabits per second: Gbps)**



Sources: TeleGeography and World Development Indicators

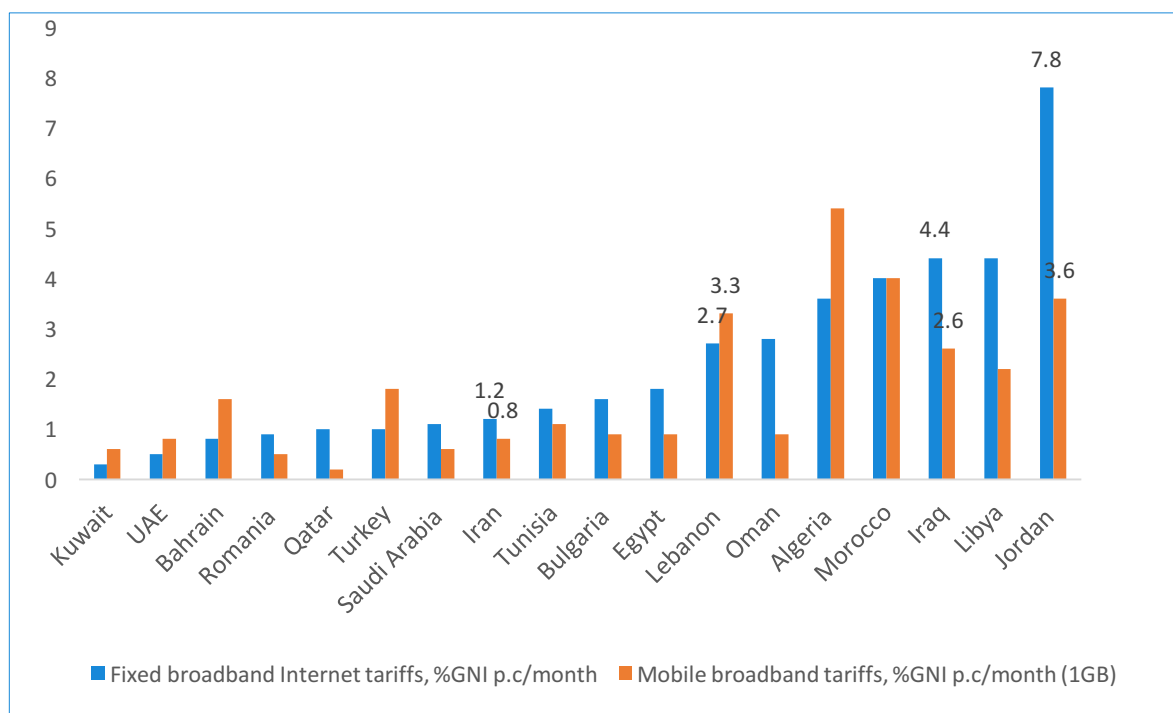
**The available speed and quality of service can be one of the underlying factors for this slow growth in usage level.** According to the Speedtest Global Index (<https://www.speedtest.net/global-index>), Lebanon ranks 30 in download speed over mobile networks, followed by Jordan, Syria, and Iraq. The mobile broadband download speed in Iraq is among the lowest in the world and the country ranks 117 out of 125. By contrast, Lebanon has one of the lowest fixed download speeds on a global scale, measured in August 2017, and ranks 131 out of 134, ahead of only Algeria, Libya, and Venezuela (Figure 8).

**Figure 8: Fixed and Mobile broadband download speed (Megabits per second: Mbps)**



Sources: World Economic Forum (WEF), NRI 2016, TeleGeography and Speedtest Global Index 2017

**Figure 9: Fixed and mobile broadband tariffs (2016 data)**



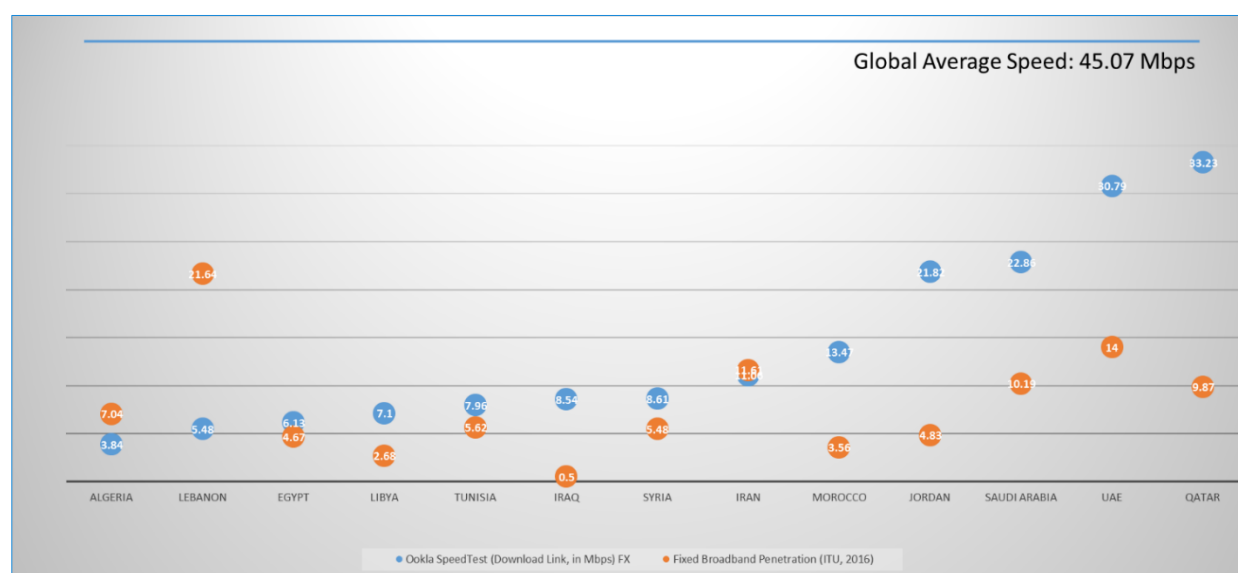
Source: International Telecommunication Union (ITU). Measuring the Information Society 2017



**Mobile broadband services seem to be affordable on average in Mashreq countries; however, fixed broadband prices are less so in Lebanon, Jordan, and Iraq compared to peers.** In 2016, mobile broadband prices for a 1 gigabyte (GB) basket in all four countries were below the 5% of gross national income (GNI) per capita threshold recommended by the UN Broadband Commission<sup>19</sup> and the world average of 6.8%, an indication of the relative affordability of broadband services (Figure 9). The same applies for a fixed broadband basket with the exception of Jordan, where prices remain excessive, standing at 7.8% of GNI.

Despite the relatively affordable tariffs, some countries in the region still provide more affordable services with higher speeds and data allowance, such as Tunisia, Oman, Bahrain, and Saudi Arabia for fixed broadband and Morocco, Oman, and Tunisia for mobile broadband. Romania and Bulgaria stand out as some of the best performing comparator countries in terms of the balance between affordability, and speed and bandwidth. In Romania, a fixed broadband basket is around 0.9% of GNI per capita and offers a speed around 100 Mbps. The countries of the Mashreq are benchmarked for speed and penetration levels in Figure 10 below.

**Figure 10: Fixed and Mobile broadband download speed (Mbps)**



Sources: Ookla Speed Test and ITU

**Based on field research conducted by the Groupe Spéciale Mobile Association (GSMA) in 2015, it is estimated that the gender gap in mobile ownership is 11% in Iraq and 21% in Jordan, while this gap is only 2% in countries like Egypt or Turkey.** Access to mobile phones and mobile services can empower women by making them feel safer and more connected. For example, mobile services can provide access to health information, financial services, or employment opportunities – often for the first time, especially for women. According to the GSMA, mobile connectivity is spreading quickly around the world; however, it is not spreading equally: especially in low- and middle-income countries, women have less access to

<sup>19</sup> In January 2018, the UN Broadband Commission adopted a new set of targets that lowers the threshold of affordability for broadband access: the “1 for 2” target, i.e., 1 GB for 2% of GNI per capita. However, at the time that the data for Figure 9 was collected, the threshold was still 5% of GNI per capita.

technology than men. Unequal access to mobile technology threatens to exacerbate the inequalities women often experience already in these countries.

**In the most recent update, the GSMA Mobile Gender Gap Report 2018 finds that even women who own mobile phones have a significant gap in usage,** particularly for transformational services, such as mobile Internet. While ownership gaps in low- and middle-income countries are on average 10%, the mobile Internet usage gap is on average 26%. The main barriers to mobile ownership are high costs followed by lack of local context and low digital literacy as well as low overall literacy, which tend to affect women disproportionately.<sup>20</sup>

**In conclusion, this benchmarking shows that Lebanon and Jordan are leaders in the use and adoption of mobile and fixed broadband services.** Yet overall, there remains a considerable gap in the adoption, speed, usage and affordability of broadband services between the four countries in the region and emerging economies such as Iran, Turkey, Romania, and Bulgaria. This is particularly the case in fiber-based access infrastructure and in the quality of services and speeds offered on both mobile and fixed networks. Specific observations are summarized below:

- Iraq exhibits the highest difference between total and broadband-enabled mobile subscriptions, showing that there is considerable room for growth in the usage of mobile broadband services among existing users of mobile networks.
- The Mashreq countries exhibit a very low penetration of fiber-based access infrastructure, as most fixed broadband is based on ADSL and fixed wireless technologies.
- The overall usage of international bandwidth per capita is currently less and has been growing at a lower rate than in comparator countries.
- While mobile broadband services seem to be affordable in Mashreq countries, emerging and regional countries leading the digital revolution offer much higher speeds for a fraction of the prices of fixed broadband services in the region.
- The gender gap in mobile ownership is 11% in Iraq and 21% in Jordan, while this gap is only 2% in countries like Egypt or Turkey.

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<sup>20</sup> GSMA Connected Women. *The Mobile Gender Gap Report 2018*. London: GSMA. February.  
<https://www.gsma.com/mobilefordevelopment/connected-women/the-mobile-gender-gap-report-2018/>.

### III. Legal, regulatory and institutional framework

**Due to various political factors, war, and instability, the reform of digital infrastructure legal and regulatory frameworks has been sub-optimal in most Mashreq countries.** International best practice shows that a competitive private sector-led digital infrastructure market based on predictable, fair, and transparent rules and regulation is most conducive to the rapid development of that market. On the one hand, clear rules are needed to create a level playing field for all parties involved, on the other hand, the regulatory environment should stimulate private investment in the country and the region to drive overall development. Thus, legal and regulatory frameworks are essential components in driving the digital transformation of the Mashreq countries.

However, the political economy of reforms and the specificities of each country, as well as fiscal pressures and war and instability, are greatly affecting market development. Navigating best practice reforms is not straightforward in the Mashreq and may require innovative ways of introducing competition and of balancing between these challenges and boosting growth of the digital infrastructure market through private sector investment and participation. Below is a high-level overview of the legal and regulatory frameworks and their challenges in the Mashreq countries.

#### A. Iran

**The telecommunications law of Iran dates to 1966** and its implementation was initially the responsibility of the Ministry of Post, Telegraph and Telephone (PTT). In December 2003, the supervision of the telecom sector was moved to the Ministry of Information and Communication Technology (MICT) and the newly created Communications Regulatory Authority (CRA).

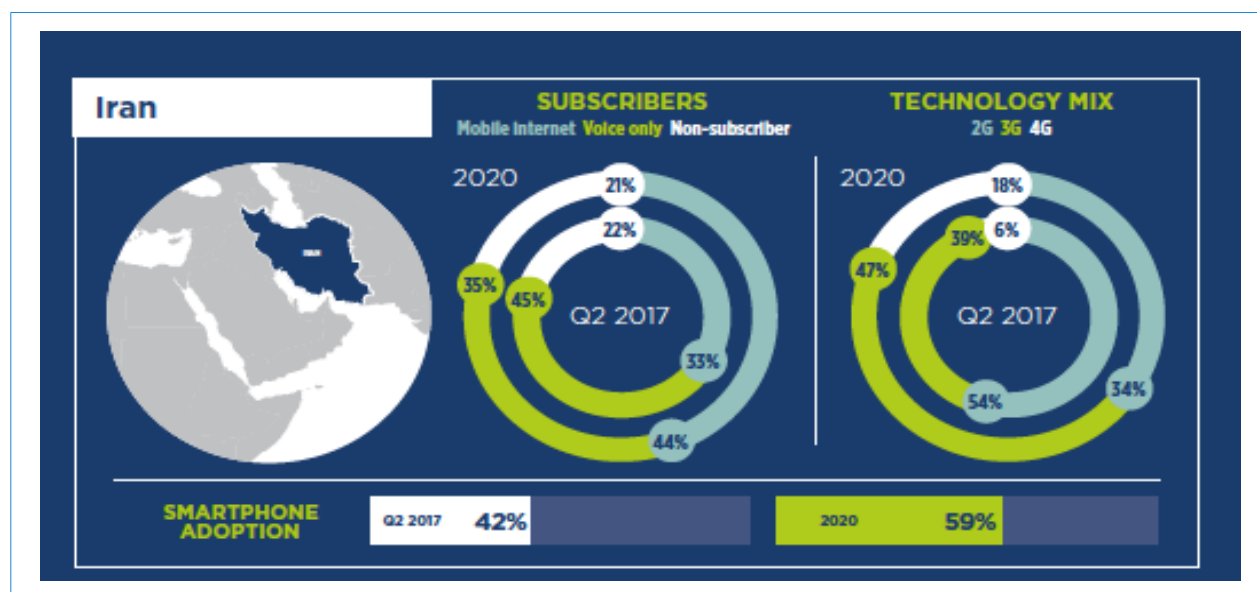
**The mobile market in Iran is dominated by two operators,** Mobile Communications Company of Iran (MCI) with 57% market share and MTN<sup>21</sup> Irancell with close to 40% market share; Tamin Telecom (Rightel) has a market share of 2.4%.<sup>22</sup> Iran has three additional mobile operators with limited local coverage, namely Taliya Mobile, Mobile Telecommunication Company of Esfahan (MTCE), and Telecommunications Kish Company (TKC). While the main mobile operators offer Long-Term Evolution (LTE) services, only MTN Irancell has a significant number of fourth generation (4G) subscribers (more than 9 million by the end of 2017).

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<sup>21</sup> MTN stands for Mobile Telephone Network, a South African mobile service provider.

<sup>22</sup> Market share figures are from TeleGeography, 2018.

Figure 11: Technology mix and smartphone adoption in Iran



Source: GSMA. *The Mobile Economy: Middle East and North Africa 2017*

Regarding mobile virtual network operators (MVNOs), Iran is the only country in the Mashreq region with one live MVNO operator, Shatel. MVNO licenses have been offered by the CRA since March 2015; so far, only Shatel is operational and one further operator (NignTel) has been announced.

The broadband market is still dominated by incumbent operator TCI (Telecommunications Company of Iran) with a market share of close to 80%. There are only two significant alternative operators, MobinNet (9%) and MTN Irancell (2.5%), and various other smaller players. These alternative providers use Worldwide Interoperability for Microwave Access (WiMAX) technology to provide broadband connectivity. However, by far the largest part of broadband connections (around 70%) is still provided through DSL lines.

## B. Iraq

Iraq still does not have a telecommunications law. The sector is overseen by the Ministry of Communications and the Communications and Media Commission (CMC) with conflicting and unclear roles and responsibilities.

The main mobile operators in Iraq are Zain Iraq (39% market share), Asiacell (34%) and Korek Telecom (19%), all of which offer Global System for Mobile communications (GSM) and third generation (3G) service only. Regional operator Fastlink, operating in the semi-autonomous region of Kurdistan, is currently the only 4G provider. Iraq's cabinet has recently approved plans to relaunch efforts to auction a fourth mobile license, after its previous attempt in late 2015 proved unsuccessful. In a statement, the CMC noted that it had already engaged PricewaterhouseCoopers (PWC) to help with the tender.

Due to the lack of a telecommunications law and any comprehensive regulatory framework, there is almost no broadband market in Iraq. Virtually all broadband connections are provided through fixed-wireless operators mostly still using WiMAX technology (94% of connections).

Only recently, liberalization of competition within the fiber optic market to increase competitiveness and attract private sector investment has been featured as the first reform in the Iraq Reconstruction and Investment Plan to improve the investment climate. This reform has not yet been achieved but could be achieved under the existing legal framework.

**To boost this market and attract investment in the overall information and communications technologies (ICT) sector, Iraq needs a sound telecommunications policy and legal and regulatory framework that promotes competition** in the market and ultimately drives prices down and increases the availability and adoption of broadband services.

As such the Government of Iraq should consider the following:

- Enact a Telecommunications Law that lays the grounds for market liberalization and provides legal and regulatory certainty for local and international investors;
- Liberalize the fiber optic market and/or adopt public-private partnerships that can build on the experience, flexibility, and innovation of private operators;
- Reinforce the regulatory authority capacity; and
- Put in place the conditions to develop Iraq as a hub for international connectivity.

## C. Jordan

**The Telecommunications Law of Jordan dates back to 1995 and established the Telecommunications Regulatory Commission (TRC) as the sector regulator.** The law has seen various amendments in 2002 and 2011 dividing the responsibilities between the TRC and the Ministry of Information and Communications Technology (MoICT).

**The mobile market in Jordan is served by three mobile operators:** Zain Jordan, Orange Jordan and Umniah. All operators offer 4G LTE services, but still less than 20% of subscribers have access to this service. The country's only MVNO (FRiENDi) shut down operations in March 2017 due to "continued financial losses", which the provider blamed on the high levels of taxation in the sector.

**The Hashemite Kingdom of Jordan has identified digital development as a high priority for the country's social and economic development.** Jordan formulated a comprehensive digital economy strategy, **Reach 2025**<sup>23</sup> in 2016 with a vision to *"have a digital economy that empowers people, sectors and businesses to raise productivity and ensure growth and prosperity, creating a highly attractive business destination for investments and international partnerships."* Jordan also committed to the launch of the World Economic Forum **"Internet for All Initiative"** in 2017. This initiative aims to ensure inclusive digital development and focuses on creating opportunities for economic growth and jobs across the Kingdom. It also focuses

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<sup>23</sup> <http://www.reach2025.net/>

on digital government and using digital infrastructure to increase work efficiency, improve work mechanisms, and promote socioeconomic development.<sup>24</sup>

**Compared to most countries in the Middle East and North Africa region, Jordan has several assets to form a particularly favorable environment for the development of advanced, private sector-led broadband networks:**

- First, Jordan has high-level leadership on digital development, as shown by the “Reach 2025” and “Internet for All” initiatives.
- Second, Jordan implemented coherent ICT policies and strategies, resulting from multi-stakeholder engagements, led by MoICT.
- Third, MoICT has a strong technical and policy competence in the sector, while the Ministry of Finance (MoF) has a clear vision of PPPs in the country, led by a specialized PPP Unit. The key government stakeholders are fully aligned.
- Fourth, in contrast to almost all other countries in the Middle East and North Africa Region, Jordan has an open and liberalized telecommunications market, with an independent regulator, TRC.<sup>25</sup>

## D. Lebanon

**The telecommunications market in Lebanon is governed by the Telecommunications Act of 2002, which established separate entities for the regulation and the operation of telecoms networks.** However, the Telecommunication Regulatory Authority (TRA) has currently only a weak advisory role to the Ministry of Telecommunications (MoT), which is mainly responsible for managing and overseeing the sector.

Lebanon’s telecommunications market is mostly controlled by the Government through the MoT, in contrast to most countries in the world. **It is also the only mobile market in the MENA region that is not open to competition** – the two mobile operators are both government owned and controlled entities. The fixed network is still fully operated and managed by *Organisme de Gestion et d’Exploitation de l’ex Radio Orient* (OGERO), the incumbent operator, under the MoT, also a structure that has long since changed in most countries. **In the Internet and data market, there is limited competition between Internet service providers (ISPs) and digital service providers (DSPs)**, and this competition is stifled by the control of essential infrastructure by MoT and the lack of regulated access to this infrastructure.

Recently, the Government authorized three DSPs to build fiber using OGERO’s passive infrastructure, by means of specific language present in the two DSPs’ original licenses, an approach that is being challenged

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<sup>24</sup> Al-Daameh, Mohamed. 2017. “World Economic Forum Launches ‘Intenet for All’ Initiative in Jordan.” *Asharq Al-Awsat*. May 23. <https://english.aawsat.com/mohamed-al-daameh/business/technology/world-economic-forum-launches-Internet-initiative-jordan>.

<sup>25</sup> The development of Jordan’s private sector led, competitive telecommunications market has been assessed, in comparison to other countries in the region, in the regional flagship report *Broadband Networks in the Middle East and North Africa: Accelerating High-Speed Internet Access*, Washington, DC: The World Bank, 2014 available at: <https://openknowledge.worldbank.org/handle/10986/16680>.

by several stakeholders. For this reason, the Government is preparing a standardized license, to bring all operators onto the same level playing field. A decree has recently been issued stipulating the rules and conditions to deploy fiber infrastructure that applies to all operators.

Sector policies have changed frequently with different governments since the mid-1990s. A complex political economy around the sector has complicated and stalled the needed reforms and precluded the development of a uniform long-term vision for the sector and has impacted the overall ability of the country to leverage the digital revolution.

The telecommunications market, however, remains a considerable source of revenues to the Government treasury. Telecom transfers to the Government averaged 3.4% of GDP annually over the past decade. It is also a rare source of hard currency, noting that the foreign currency-denominated portion of public debt is equivalent to about 56% of GDP.

It is important for the Government to have a better understanding of the composition of fiscal revenues from the telecom sector. At present, the visibility and control mechanisms over the accounts are inadequate especially considering the significance of the sector as a source of revenues, including foreign currency revenues, to the Government. As such, these mechanisms should be enhanced for both sector and macroeconomic considerations. This would also allow a more accurate assessment of the fiscal impact of reforms in the short, medium, and long term.

Against this backdrop, the Government should proceed with caution in reforming the sector but also develop a medium- to long-term vision on how best to balance between the potential contingent liabilities for the public sector and sector reforms that can boost economic development and competitiveness.

The remaining challenges at the governance, policy, and regulatory levels are:

- Lack of comprehensive and consistent sector policies and weaknesses in the extent to which the legal and regulatory framework support competition, innovation, and ICT development.
- No separation between the roles of policy making, regulation, and operation.
- Lack of standard and transparent licensing procedures and terms for private DSPs (e.g., differences in spectrum allocation and revenue sharing).

## E. Syria

**Syria has one of the newest telecommunications laws in the region, which was enacted in 2011.**<sup>26</sup> This law separates responsibilities between the Ministry of Communications and Technology (MoCT) and the Syrian Telecom Regulatory Authority (SyTRA). The new law also established Syrian Telecommunication Establishment (STE) as an exclusive fixed and international operator, operating as Syrian Telecom (ST) with a 20-year concession. The law also requires that operators have an individual license and a class license to operate.

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<sup>26</sup> The year the conflict started in the country.



**The mobile market in Syria is served by two operators with near equal market shares:** MTN Syria and SyriaTel. The process of licensing a third operator in 2011 was derailed by the turmoil in the country. TeleGeography reported in January 2017 that a consortium of Iranian companies would be awarded the third mobile license in Syria with a minority stake to remain with the Syrian government. No updates on this matter have been recorded to date.<sup>27</sup>

**With a household penetration of around 28%, the broadband market in Syria is underdeveloped.** The main service providers are Syrian Telecom (41% market share), SAWA ISP (29%), High & Fast Internet, RunNet, and various other smaller players. Technology is mostly based on DSL lines, with MTN Syria offering some connectivity using WiMAX.

**The World Bank's 2017 report entitled *The Toll of War: Economic and Social Consequences of the Conflict in Syria* observes that Syria's civil war has had a devastating toll on the country's economic, social and human development, and that the longer the conflict lasts, the more persistent its effects will be.**<sup>28</sup>

Another report by the International Monetary Fund (IMF) indicates that Syria's GDP today is less than half of what it was before the war started and it could take two decades or more for Syria to return to its pre-conflict GDP levels. While reconstructing damaged physical infrastructure will be a monumental task, rebuilding Syria's human and social capital will be an even greater and lasting challenge.<sup>29</sup>

## F. Conclusion

**Market liberalization is key to a successful telecommunications sector.** This includes the licensing of many alternative providers, including MVNOs or private ISPs. In the Mashreq region, currently only Iran has one operational MVNO. For comparison, Bulgaria has four mobile operators and four MVNOs, while Turkey has three mobile operators and six operational MVNOs. MVNOs contribute to a growing sector, while maintaining competitive price levels.

**To enable the full potential of the ICT sector in the Mashreq region, telecom ministries and regulatory authorities should consider these best practice approaches:**

- Introduction of general authorization or unified licensing scheme based on technological neutrality and open market entry principles;
- Encouraging and enabling a wide range of operators and service providers without restrictions on the number of authorized providers;

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<sup>27</sup> TeleGeography. 2017. "Iranian consortium to be awarded a mobile license in Syria."

<https://www.telegeography.com/products/commsupdate/articles/2017/01/18/iranian-consortium-to-be-awarded-a-mobile-licence-in-syria/>.

<sup>28</sup> World Bank. 2017. *The Toll of War: Economic and Social Consequences of the Conflict in Syria*. Washington, DC: The World Bank. <https://www.worldbank.org/en/country/syria/publication/the-toll-of-war-the-economic-and-social-consequences-of-the-conflict-in-syria>.

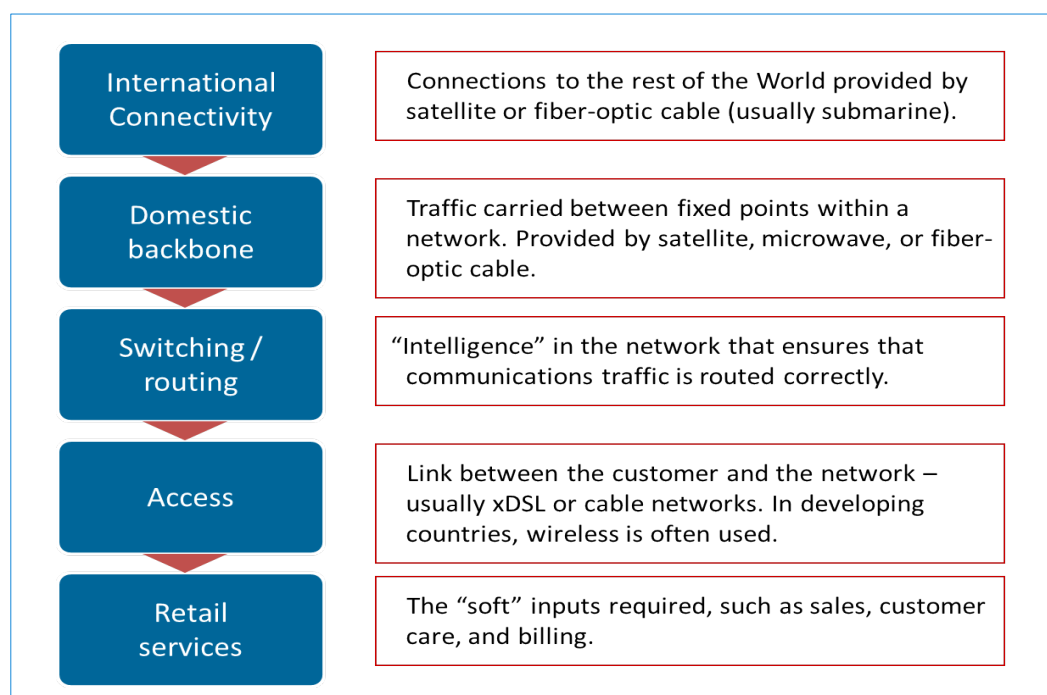
<sup>29</sup> Gobat, Jeanne and Kristina Kostial. 2016. "Syria's Conflict Economy." IMF Working Paper WP/16/123. (Washington, DC: International Monetary Fund). <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Syrias-Conflict-Economy-44033>.

- No restrictions, such as minimum investment obligations: the successful examples of Eastern Europe show that small and micro operators can be a formidable force behind the development of broadband; it should be the market, and not the Government, to determine the number of players, through competition and consolidation;
- Assess the taxation burden on the sector with the view of a possible reduction of the overall burden: rather than extracting value directly from the ICT sector, governments should focus on the contribution to overall economic growth enabled through ICT; and
- Leverage international/regional infrastructure through cross-border operators (e.g., for additional international gateways or more IXPs).

## IV. Inventory of digital infrastructure in the Region

**Digital or broadband infrastructure has major implications on the speed, quality and availability of broadband services.** The broadband supply chain can be divided into three main network components: access infrastructure, backbone and backhaul, and international connectivity (Figure 12). Each network component has different technical, market structure, and economic characteristics. To provide high speed broadband services to end-users, all components should have enough bandwidth and be robust and reliable. Competition can be introduced at any level of the value chain, but the access network tends to have higher sunk costs and thus fewer competing players. Any bottleneck in the chain, for instance in the backbone or international connectivity, will result in a lower quality and lower bandwidth to the end-user. At the access last mile, retail service providers can leverage the existing infrastructure without building their own to provide services.

**Figure 12:** Broadband network supply chain



*Source: Mark D.J. Williams, 2010*

### A. International connectivity

**International connectivity** provides the Internet connection of a country to the worldwide Internet infrastructure. **In most countries, including in the Middle East and North Africa region (MENA) international connectivity is provided through submarine cables**, with a smaller percentage provided

through terrestrial fiber, microwave, or satellite.<sup>30</sup> Submarine cables and cable landing points require considerable investment and are usually deployed through partnerships between several local and international market players. Alternative international networks and terrestrial networks provide countries and regional Internet markets with redundancy routes and minimize the impacts of breakages and cuts in submarine cables.

**The Mashreq region has a strategic geographic position with respect to the global Internet infrastructure.** The strong growth in global bandwidth demand, driven by the diffusion of Ultra-Fast Broadband (UFB) in all regions, as well as by the development of data-intensive and video services and applications. **The Mashreq is at the crossroads of the highest growth segment of the global data connectivity, the Europe-Asia Internet traffic route.** Most broadband networks linking Europe and Asia are delivered through submarine cables, and transit through Alexandria, Egypt; the Sinai; the Red Sea; and the Bab El-Mandeb Strait. Disruption to the submarine cable infrastructure has an impact for hundreds of millions of customers. **Hence, the Mashreq region is an important region to increase the overall redundancy of the global Internet infrastructure by offering alternative routes to global Internet connectivity.** In addition, terrestrial networks have cost and latency advantages, opening the door to terrestrial networks in Iraq, Iran, and Jordan at the center of the Europe-Asia redundancy terrestrial routes.

**Broadband subscription growth, and growth in data-intensive services and applications, will be an important driver of the increase in the demand for international bandwidth in the region.** As is the case in emerging markets worldwide, three factors are increasingly driving demand for higher international bandwidth and consequently attracting more investors to a growing market:

- the increase in the number of broadband subscribers of both fixed and mobile networks;
- the overall lower prices of 3G and 4G mobile devices that enable more data consumption; and
- the growth in the average bandwidth per subscriber.

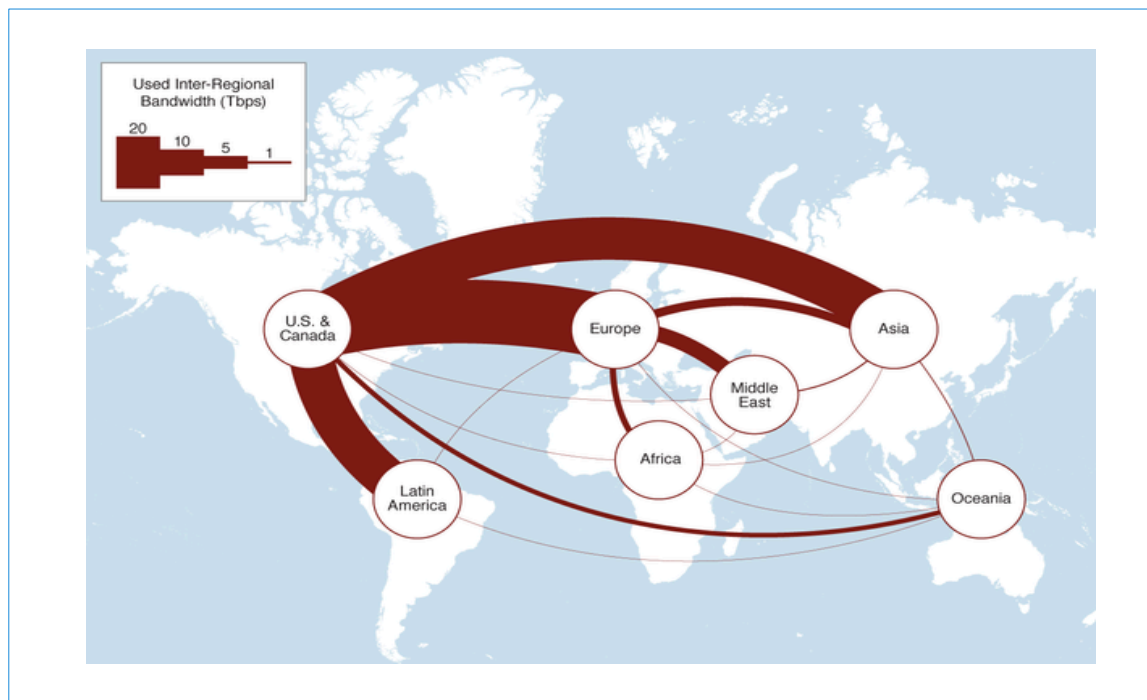
**On the other hand, there is considerable global demand for transiting international data traffic between the Gulf and Europe and between Asia and Europe through Iraq and Jordan.** The demand for transit traffic comes from the growth in bandwidth in the Middle East region and the demand for redundancy links on the Asia to Europe routes. **The Europe-Asia Internet transit route is among the most dynamic in the world.** Demand for transit traffic on this route has been growing considerably since 2010 with a compounded annual growth rate of 40% according to TeleGeography. This growth in demand has been met with increased investment in the capacity of existing submarine cables and the entrance of five new cable systems, bringing the total number of active submarine systems to eight, and providing the route with plenty of new capacity.

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<sup>30</sup> Gelvanovska, Natalija, Michel Rogy and Carlo Maria Rossotto. 2014. *Broadband Networks in the Middle East and North Africa: Accelerating High-Speed Internet Access*. Washington, DC: The World Bank, p. 59 and Chapter 3. <https://openknowledge.worldbank.org/handle/10986/16680>.

**Capacity on the Europe-Asia route also serves several distinct regional markets along the way: the Middle East, the Gulf States, Sub-Saharan Africa, and Asia.** The Middle East and the Gulf markets are also some of the fastest growing in the world. Most countries in the Mashreq are in the emerging and developing phase, and broadband markets are expected to grow significantly soon given the strong and increasing demand for broadband. Cisco reports that traffic in the Middle East and Africa region will be the fastest growing with a 42% compounded annual growth rate from 2016 to 2021.<sup>31</sup> UAE, Saudi Arabia, and Turkey are among the highest users of international bandwidth. Today, 85% of the Internet traffic used in MENA is connected to Europe (Figure 13) and has increased at a compounded rate of 53% since 2010 (TeleGeography, 2015).

**Figure 13: International bandwidth use across regions**



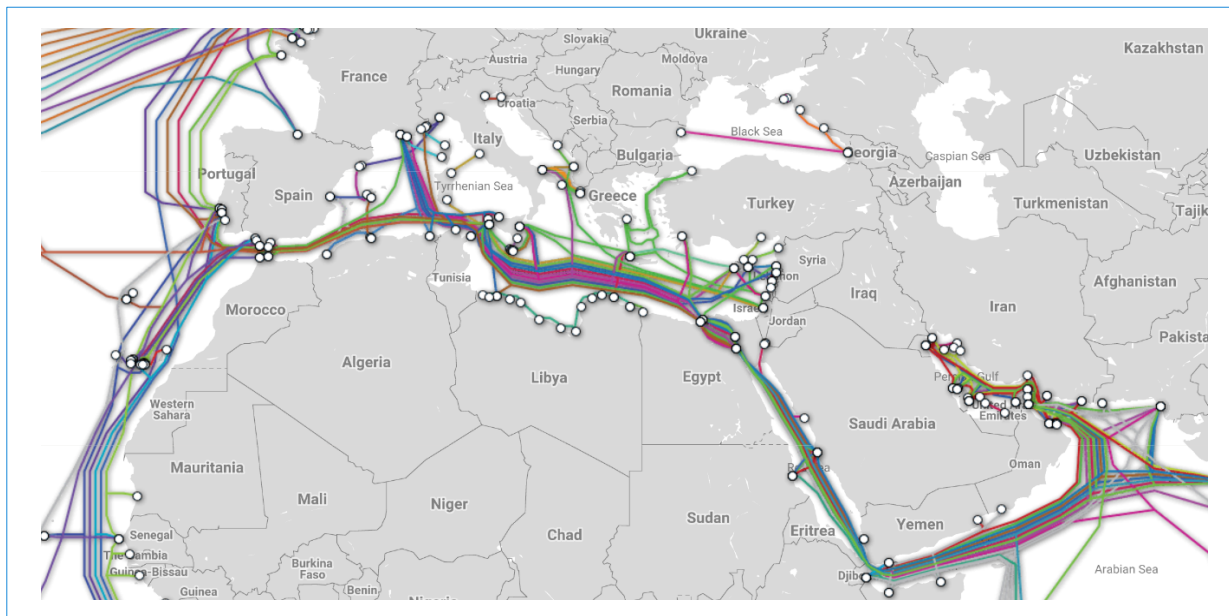
Source: TeleGeography, 2015

**The Europe-Asia Internet traffic route that also serves the Gulf region is however mostly concentrated in the Red Sea Corridor,** passing through Egypt to the Mediterranean (Figure 14). This concentration exposes traffic to the security and political vulnerabilities in Egypt. Since 2008, several disruptions to submarine cables caused considerable interruptions in traffic including three simultaneous cable cuts in Egypt that disrupted all key markets of the Middle East and South Asia, including 80% of India's international bandwidth. This has ignited investors' interest in alternate terrestrial routes that surpass the Red Sea Corridor and provide more resilience and

<sup>31</sup> Cisco. 2016. *Complete VNI Forecast Highlights: Middle East and North Africa 2021*. [https://www.cisco.com/c/dam/m/en\\_us/solutions/service-provider/vni-forecast-highlights/pdf/Middle\\_East\\_and\\_Africa\\_2021\\_Forecast\\_Highlights.pdf](https://www.cisco.com/c/dam/m/en_us/solutions/service-provider/vni-forecast-highlights/pdf/Middle_East_and_Africa_2021_Forecast_Highlights.pdf).

redundancy to Europe-Asia traffic. Another key advantage of terrestrial networks is their ability to follow more direct routes and therefore decrease latency.

**Figure 14: Submarine cables serving the Europe-Asia route**

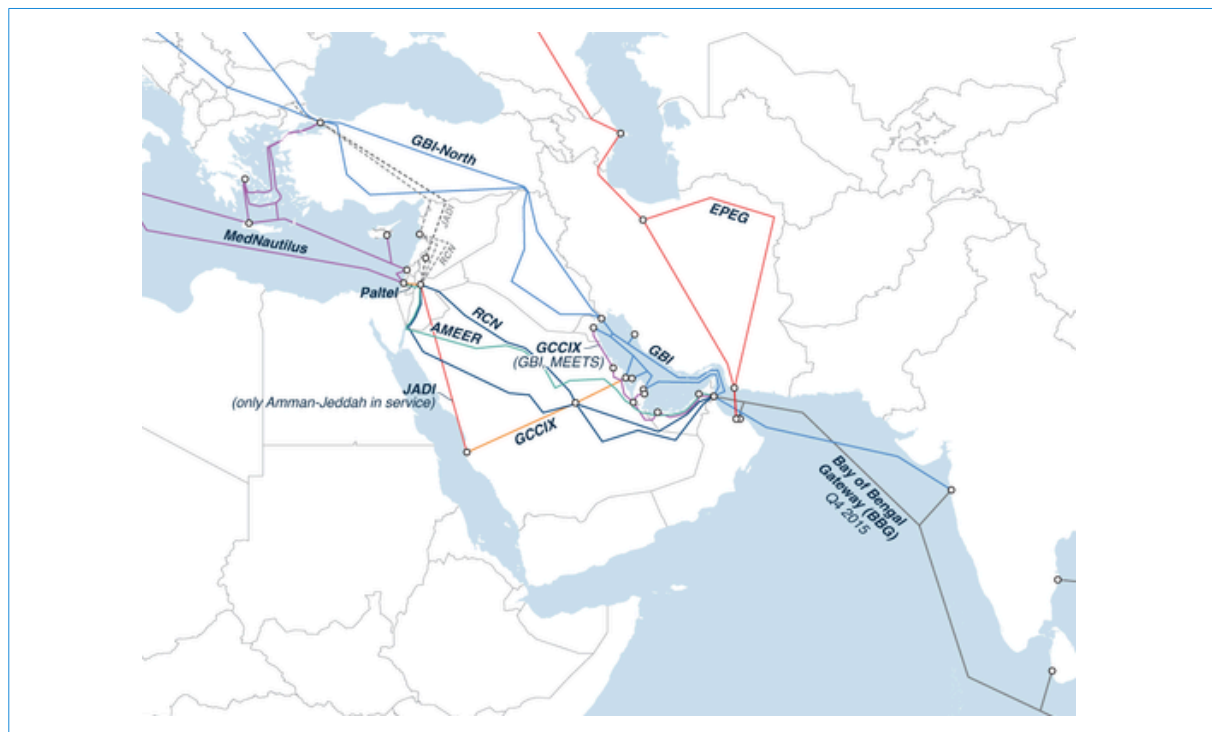


Source: TeleGeography, 2018

**Several terrestrial routes linking East Asia and China to Europe via the Gulf Countries have emerged in recent years to duplicate the Red Sea Corridor submarine cables and to provide lower latencies by following more direct terrestrial routes.** Depicted in Figure 15, these networks include:

- The Europe Asia Express Gateway (EPEG), which links Germany to Oman via Russia and Iran;
- The Alternative Middle East Europe Route (AMEER), a hybrid joint venture alternative route passing through Saudi Arabia, Jordan, Palestine, Israel and Turkey. Demand on this route has been limited due to political concerns;
- The Jeddah-Amman-Damascus-Istanbul (JADI) cable linking Saudi Arabia to Turkey. The network is unable to reach Turkey due to the civil war in Syria.
- The Regional Cable Network (RCN) is similar to JADI, yet with a much longer route. RCN is also not fully operational due to the civil war in Syria.

**Figure 15:** Terrestrial routes connecting submarine cables to Europe via MENA



Source: TeleGeography, 2014

Thus, Iraq and Lebanon, due to their strategic position between the Persian Gulf and Turkey, constitute one of the most direct routes connecting the Gulf to Europe. The following sections analyze the status of international connectivity in each of the countries of the Mashreq.

**Iraq is linked to the global Internet network via the south of Iraq, Turkey, and Iran.** Traditionally, Iraq was connected to the Internet network solely via the submarine cable landing in Al-Faw on the Persian Gulf and passing through the Iraq Telecommunication and Post Company (ITPC), the incumbent fixed network. However, the Kurdistan Regional Government (KRG) has recently officially licensed four operators to provide terrestrial international connectivity to the Region independently of ITPC, linking KRG and Iraq network nodes in major cities to the international network via two crossings, one in Turkey and one in Iran.

**With a combined capacity exceeding 1 terabyte per second (Tbps), and access to multiple submarine cables and terrestrial cross-border connections, Jordan's international connectivity is secure,** and the country has sufficient capacity to meet current and future medium-term needs. All telecom operators have access to international connectivity, with full competition resulting in a favorable price for international bandwidth,

**At Aqaba on the Red Sea, two submarine cables provide international connectivity on an open access basis.** In addition, the national electricity grid in Jordan (National Electricity Power Company (NEPCO)) and Egypt (Egyptian Electric Transmission Company (EETC)) have installed a submarine fiber optic cable alongside a high voltage power line interconnecting their networks and making the excess capacity available to telecom operators in Jordan. In terms of terrestrial regional connectivity, Jordan is perfectly



interconnected at the regional level with cross-border links to Egypt, Syria, Israel and the Palestinian territories, and Saudi Arabia. NEPCO also provides connections with Syria and the Palestinian territories (Jericho). Jordan Telecom owns and operates a 4,000-kilometer (km) long fiber optic backbone covering a large part of the territory, which uses synchronous digital harmony (SDH) and dense wavelength division multiplexing (DWDM) technology and offers the potential for high bandwidth with good security. Jordan Telecom Group (JTG) has a wholesale offer which is publicly available on their website. Competitors Zain and VTEL Jordan also own and operate their own fiber optic backbone.

**In Lebanon, international connectivity is mostly provided by submarine cables.** The MoT owns the entire international connectivity value chain (submarine cables, landing stations, and international gateways)<sup>32</sup> and thus the state is the monopoly provider of international data connectivity to OGERO's own operations and private operators. In June 2017, the MoT reduced the price of rental of an E1<sup>33</sup> line from US\$250 per line per month to rates starting from US\$110 per line per month, with volume discounts bringing the price down to US\$70 per line per month.<sup>34</sup>

**Lebanon is part of the nine-member telco consortium behind the India-Middle East-Western Europe (I-ME-WE) international submarine fiber optic cable,** connecting to Lebanon via a landing station at Tripoli (also known as Tarabulus). I-ME-WE continues to Alexandria and then Marseille. Lebanon is also connected to Europe via the CADMOS cable to Cyprus in cooperation with Cyprus Telecommunications Authority (CYTA), the dominant telecom operator. More recently, in September 2017 CADMOS' capacity was increased to 500 Gbps, with the Lebanese government and CYTA sharing the cost of the project. The MoT also routes international traffic on two older submarine cables, Berytar (Beirut-Tartous) and Aletar (Alexandria-Tarsous), which connect the country to Syria and Egypt, respectively.

As part of the Government's 2018 Capital Investment Plan, the installation of two additional cables is being studied, in order to link Lebanon with landing stations in Greece and Italy and to increase the redundancy of Lebanon's international backbones.

**Given its strategic position between the Red Sea and Turkey, Syria is part of several regional terrestrial fiber optic cables aiming to connect regional countries and channel traffic from Asia to Europe:** these are JADI and the RCN. RCN was partly-lit in May 2015, stretching from Fujairah (UAE) through Riyadh (Saudi Arabia) and Amman in Jordan. The Syria/Turkey part of it has not been completed amid the continuing conflict in Syria. Meanwhile, Syria, Iran, and Iraq signed a joint agreement aimed at establishing fiber optic connectivity between their countries in May 2013.<sup>35</sup> **The Syria-Turkey cable was**

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<sup>32</sup> The MoT owns stakes in three international fiber optic cable systems: Syria-Lebanon ('Berytar', 46.9 %), launched 1997, 5Gbps, 134km, Tartous (Syria) to Beirut; Cyprus-Lebanon ('Cadmos', 38%), launched 1995, 2x622 Mbps, 230km, Pentaskinos (Cyprus) to Beirut; and Egypt-Syria ('Aletar', 6.25%), launched 1997, 5Gbps, 787km, Tartous (Syria) to Alexandria (Egypt). Two satellite earth stations also provide international links.

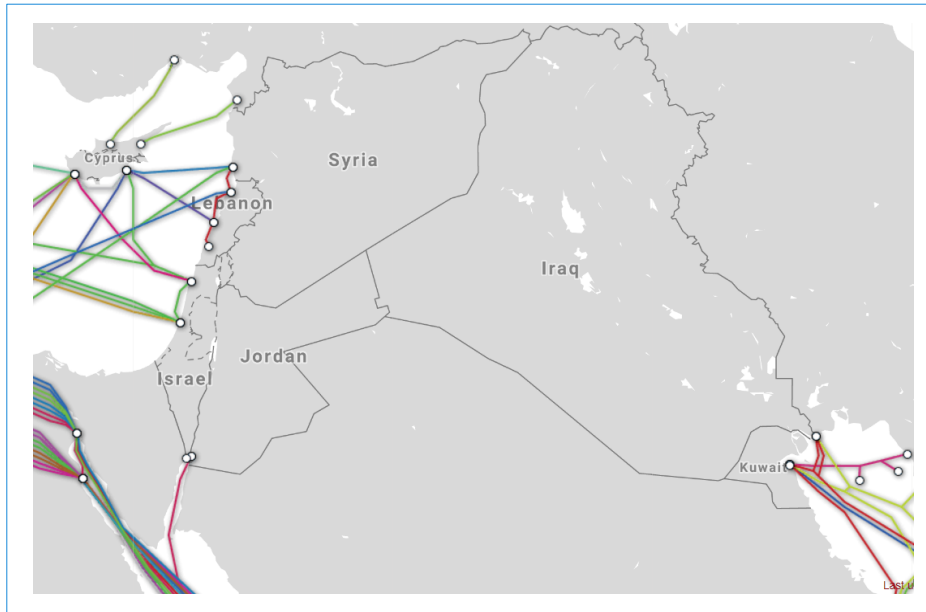
<sup>33</sup> European format for digital transmission.

<sup>34</sup> Some international capacity is also provided by satellite links which are provided by the private sector. However, this capacity is very limited, and the cost is high compared to the submarine cables.

<sup>35</sup> Source: TeleGeography, Commsupdates, various years

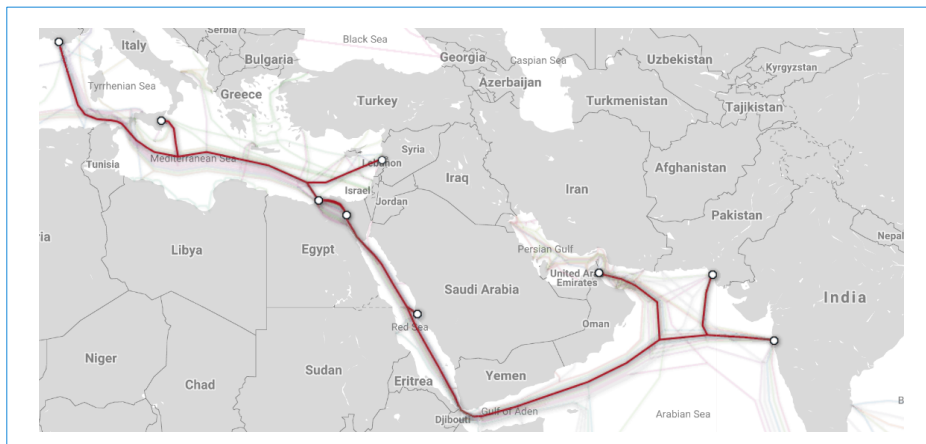
reportedly damaged in August 2013,<sup>36</sup> following intense fighting in the city of Saradiq, through which the fiber optic cable linking Aleppo to Turkey passes.<sup>37</sup>

**Figure 16: Mashreq submarine cables**



*TeleGeography, 2018*

**Figure 17: I-ME-WE submarine cable**

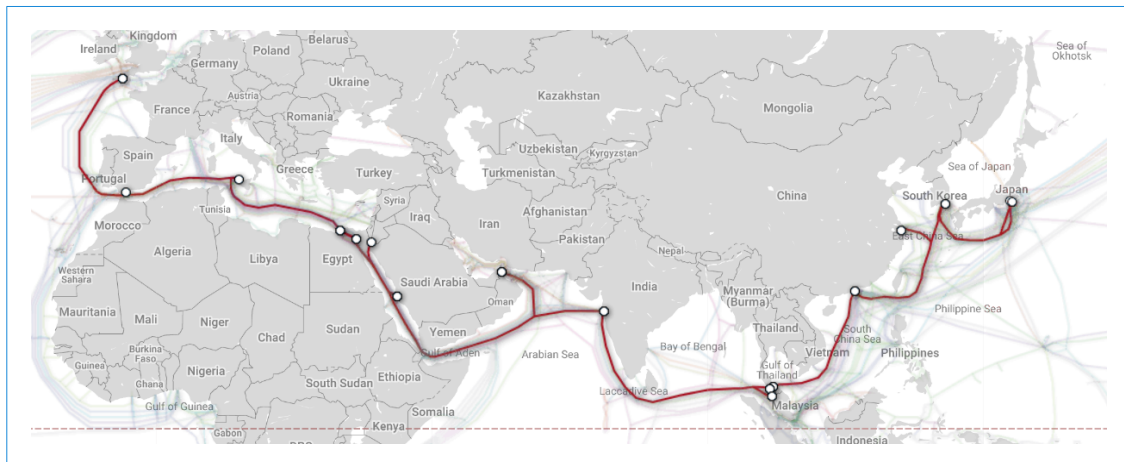


*TeleGeography, 2018*

<sup>36</sup> Peterson, Andrea. 2013. "Syria's largest city just dropped off the Internet," *Washington Post*. August 30. [https://www.washingtonpost.com/news/the-switch/wp/2013/08/30/syrias-largest-city-just-dropped-off-the-Internet/?utm\\_term=.8e660be8af64](https://www.washingtonpost.com/news/the-switch/wp/2013/08/30/syrias-largest-city-just-dropped-off-the-Internet/?utm_term=.8e660be8af64).

<sup>37</sup> Madory, Doug. 2016. "War-torn Syrian city gets new fiber link." Oracle Dyn Blog. October 12. <http://dyn.com/blog/war-torn-syrian-city-gets-new-fiber-link/>.

**Figure 18: Flag submarine cable**



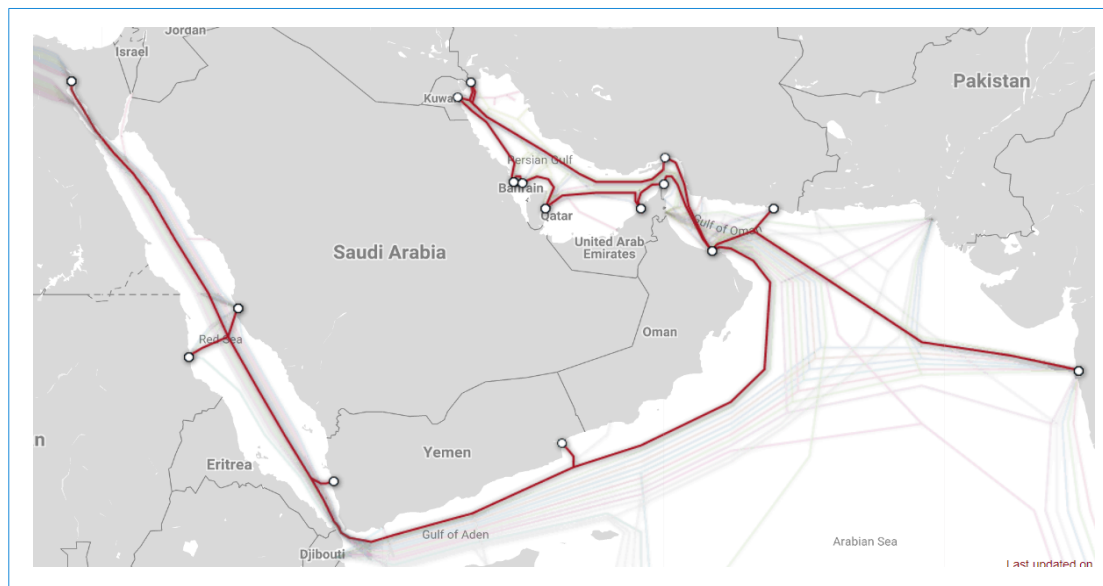
*TeleGeography, 2018*

**Figure 19: Gulf Bridge International Cable System (GBICS)**



*TeleGeography, 2018*

**Figure 20: Falcon submarine cable**



*TeleGeography, 2018*

## B. Internet Exchange Points (IXPs)

**The presence of independent ISPs, IXPs, and data centers is inadequate throughout the Mashreq region.** Data Center Map (<https://www.datacentermap.com/>), an online resource focused on mapping data centers around the globe, shows only one data center in Lebanon, five in Jordan, and twenty in Iran. This compares to more than 40 data centers in countries like Turkey or Romania. Data centers are highly important as they enable the digital economy by providing connectivity and cloud services.

**A similar picture emerges in the number of IXPs per country:** According to sources such as the Packet Clearing House (<https://www.pch.net/>, an international organization responsible for providing operational support to critical Internet infrastructure, such as IXPs) or PeeringDB (<https://www.peeringdb.com/>, a web database for Internet peering data), **Syria, Iraq, and Jordan are listed as countries without IXPs.** Lebanon has two (Beirut-IX, established in 2007, and fully operational, and A-IX, established in 2017), Iran has four IXPs (Teheran IX, Shiraz IX, Tabriz IX, and Mashhad IX, all established in 2016). In comparison, Norway, despite its small population, has a total of five IXPs (the earliest one established in 1993); Romania also has five IXPs, the earliest one established in 1999 (Table 2)).

**Table 2: Number of IXPs in Selected Countries**

Country	IXPs
United States	90
Russia	27
Germany	19
Poland	10
Netherlands	8
Norway	5
Romania	5
Singapore	5
Iran	4
Lebanon	2
United Arab Emirates	2
Turkey	2
Iraq	-
Syria	-
Jordan	-

*Source: Packet Clearing House, 2018*

**In countries without IXPs, Internet traffic is typically carried by an incumbent operator** (and sometimes also by one or more mobile operators) via bespoke international leased lines, which typically results in low overall bandwidth availability, low quality of service, and high service pricing.

**IXPs in combination with data centers are critical in enhancing the quality of service and user experience for all online services**, as they provide significantly reduced latency (fewer delays in accessing most content locally rather than from overseas), better routing on the regional level and greater resilience by offering alternative online access routes. Of course, increasing competition among access providers also greatly reduces overall price levels, improving affordability for business and residential end-users.

## C. Backbone

Backhaul aggregates data traffic from wireless base stations to carry to the various regional distribution nodes. Traditionally aggregation of wireless traffic was carried through microwave wireless networks and/or copper leased lines from the incumbent. However, with the increasing demand for higher capacity mobile data and streaming services, backhaul networks are increasingly relying on fiber optic cables. **Backbone carries traffic from different regional distribution nodes to the landing point of the international connection.** Backbone networks should supply sufficient national fiber capacity to all

regions and to the various broadband players in the market. National fiber backbone infrastructure plays an essential role in enabling the diffusion of broadband access services. In addition to competition at the access level, competitive backbone and backhaul infrastructure promote access to better quality Internet connection at lower prices. In dense and profitable regions, private investments compete to provide intercity connectivity. In remote areas, however, government support through a variety of mechanisms is needed to extend the national infrastructure where a sparse population may not provide positive return on investment for purely private investment.

**In Iraq, the ITPC is responsible for the operation, maintenance, and expansion of the national backbone.**

**The operator continues to expand the reach of its networks;** it announced in 2016 that it was deploying 286,000 FTTH lines in the capital, as well as 187,500 in Rusafa, 98,500 in Karkh and a total of 218,500 in the provinces. The security crisis and the war have had a considerable toll on the national backbone infrastructure in Iraq; in many areas the network has been destroyed and subject to theft and vandalism. In November 2017, ITPC complained of a series of attacks on its FTTH network, stating that in addition to fiber being cut and cabinets being torched, civil organizations were attempting to physically block the rollout. In a more recent development, in December 2017 ITPC signed a contract to install fiber links to connect government departments as part of an e-government program.

Four network operators provide backbone and international connectivity in the Kurdistan Region of Iraq (KRI): Allai Newrooz, Alsard Fiber, Iraq Cell, and IQ Networks. These four operators provide intercity connectivity as well as connectivity to the global Internet. With four backbone operators, intercity connectivity in the KRI is competitive.

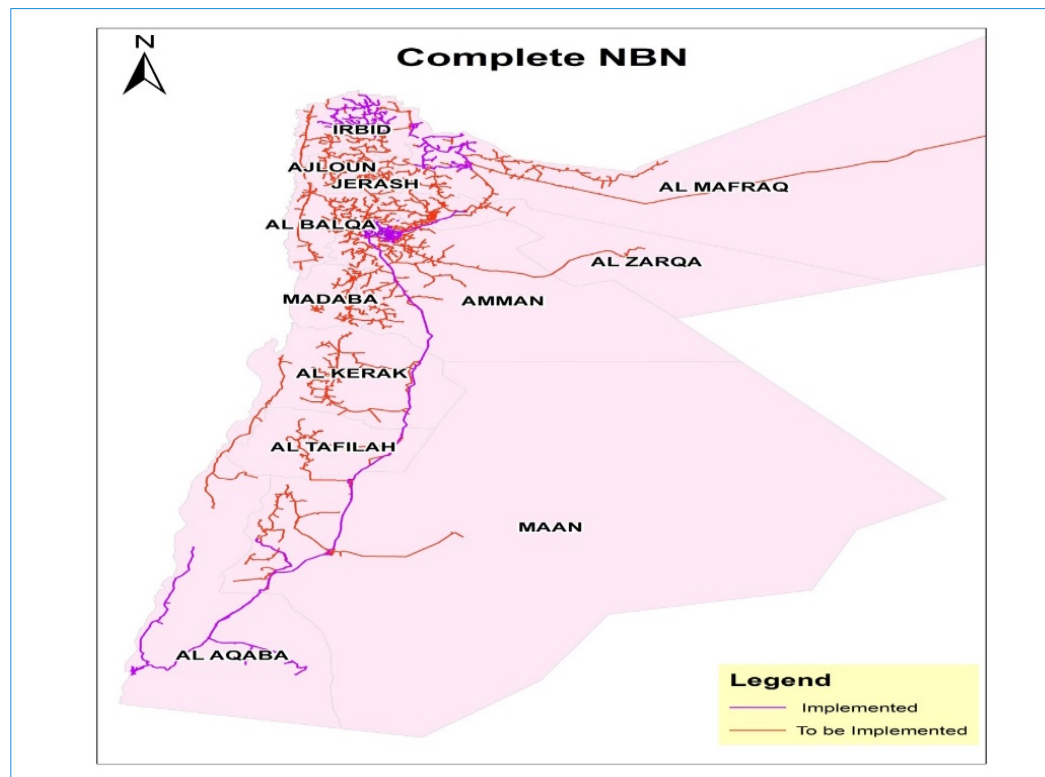
**Figure 21: Iraq Backbone**



*Source: ScopeSky (Government of Iran private sector partner)*

The Government of Jordan has successfully implemented a government backbone network in the context of an open and competitive telecommunications sector, and in the context of the development of a strategy to deliver digital government services to schools, health establishments, and government centers. The Government has also deployed a comprehensive national broadband network (NBN), which was the object of a preliminary assessment carried out in the context of World Bank technical assistance.

**Figure 22: The National Broadband Network (NBN) of Jordan**

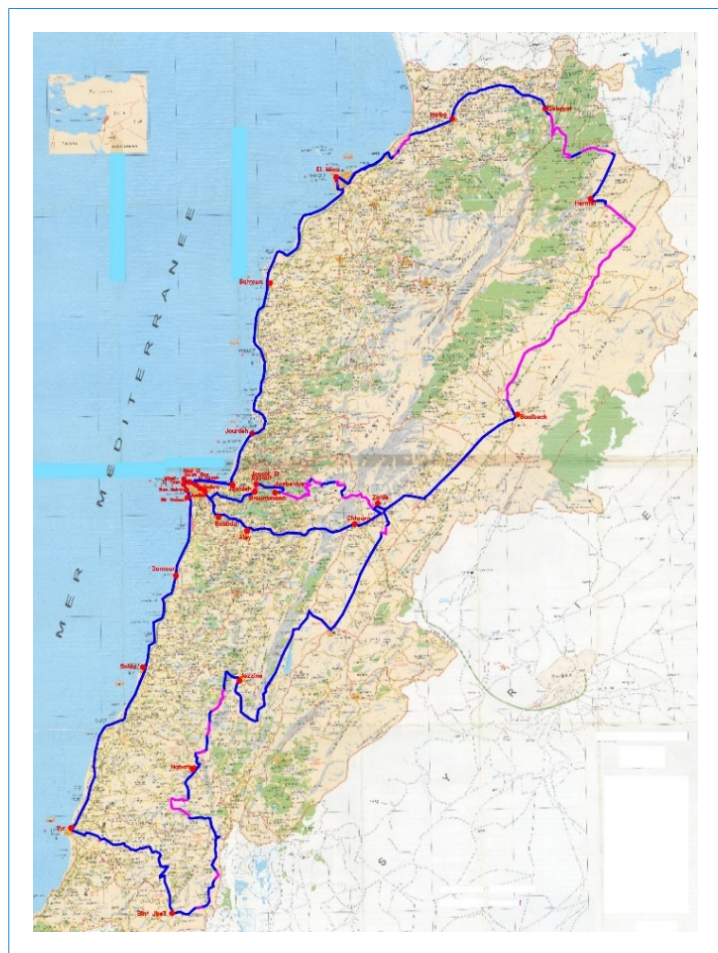


Source: MoICT, Jordan

**Lebanon's fixed line market is a monopoly of state-owned MoT/OGERO.** The fixed infrastructure covers over 95% of the country and has undergone a series of modernization projects to significantly improve domestic backbone and international transmission networks, which began in 2011 but were not satisfactorily implemented until the second half of 2015 (Figure 23). The expansion aimed at linking approximately 300 central offices to the national backbone through two main rings, the north and south rings.



**Figure 23:** Lebanon's Fiber Optic Backbone Rings



Source: Lebanon, Ministry of Telecommunications

**Syrian Telecom (ST) currently has a monopoly on the provision of all fixed line voice services, public switched telephone network (PSTN) infrastructure, transmission networks, and international gateways. ST reports having a national fiber optic backbone, extending roughly 1,100km.**

**Within this domestic network, the Syria-Turkey cable was reportedly damaged in August 2013,<sup>38</sup> following intense fighting in the city of Saradiq, through which the fiber optic cable linking Aleppo to Turkey passes.<sup>39</sup> In addition, national connectivity between Aleppo and the interior cities of Syria was damaged. In the absence of infrastructure to connect Aleppo to the rest of the country and to the**

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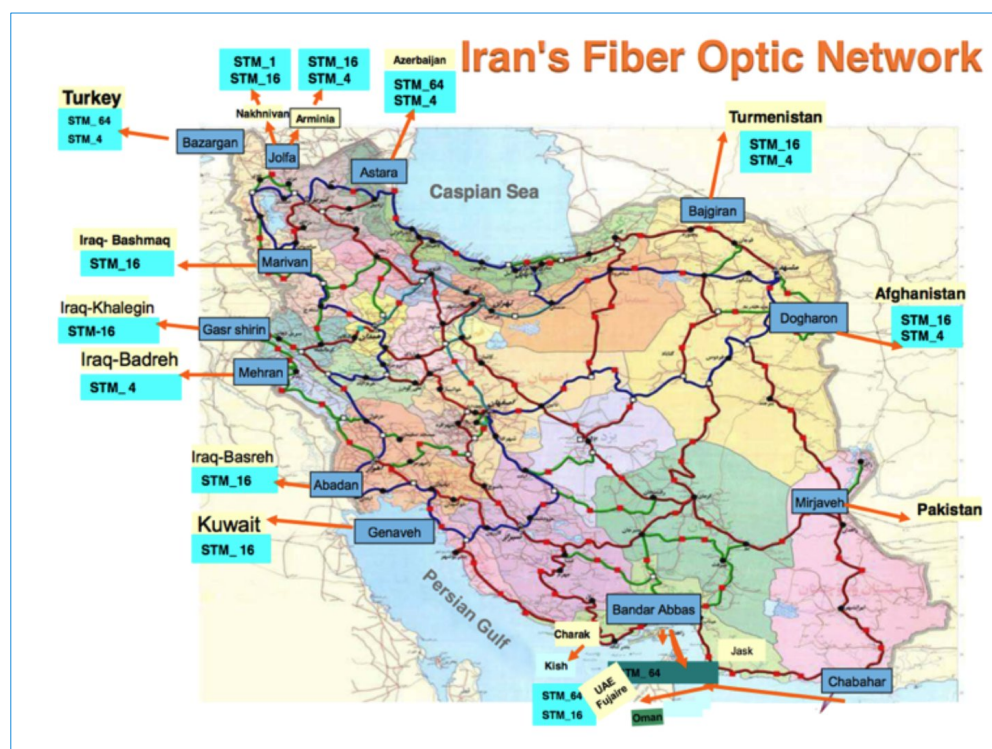
<sup>38</sup> Peterson, Andrea. 2013. "Syria's largest city just dropped off the Internet," *Washington Post*. August 30. [https://www.washingtonpost.com/news/the-switch/wp/2013/08/30/syrias-largest-city-just-dropped-off-the-Internet/?utm\\_term=.8e660be8af64](https://www.washingtonpost.com/news/the-switch/wp/2013/08/30/syrias-largest-city-just-dropped-off-the-Internet/?utm_term=.8e660be8af64).

<sup>39</sup> Madory, Doug. 2016. "War-torn Syrian city gets new fiber link." Oracle Dyn Blog. October 12. <http://dyn.com/blog/war-torn-syrian-city-gets-new-fiber-link/>.

international Internet network, the city was not connected to the Internet through the official government network for an extended period. It was not until 2015 that the incumbent operator ST was able to reinstate international connectivity to part of Aleppo through a high capacity microwave link to Damascus and thereafter to the coastal city Tartous that harbors Syria's international cable landing station. Most recently in October 2016, ST completed a new fiber optic link from Aleppo to the national core network in Damascus, and thus reinstating national and international connectivity to government-controlled areas of Aleppo.<sup>40</sup>

Iran has a country-wide fiber backbone network operated by incumbent operator Telecommunication Infrastructure Company (TIC) connecting all major cities and regions of the country (Figure 24).

Figure 24: Iran's Fiber Optic Backbone Network



Source: TIC, [www.tic.ir](http://www.tic.ir)

## D. Access networks

**Access networks, also known as last mile,** connect end-user premises (business or residential) with the nearest fixed network node or wireless base station. Broadband access can be provided through fixed networks such as copper local loops, fiber optic or in some countries coaxial cable, or through wireless technologies such as mobile networks and wireless access networks.

<sup>40</sup> TeleGeography. 2016. "STE deploys fiber-optic link in Aleppo." October 13. <https://www.telegeography.com/products/commsupdate/articles/2016/10/13/ste-deploys-fibre-optic-link-in-aleppo/index.html>.

**In most emerging markets, including in MENA, mobile broadband is quickly becoming the dominant broadband access technology**, because of the relatively lower cost of network deployment and higher adoption among consumers. Yet fiber to the home or premises is the only technology that can currently deliver fast and Ultra-Fast Broadband (UFB) services, and therefore remains the future-proof technology that can accommodate the growing demand of societies. Financial and economic factors significantly constrain the extensive deployment of fiber, especially in sparsely populated areas or regions with low demand. As a result, governments are increasingly adopting national strategies that build on a mix of private sector incentives, government funding, and public-private partnerships to increase the deployment of last mile fiber infrastructure.

### Fixed Access Networks

**As stated in the previous section, fixed broadband penetration and usage is mostly based on the legacy copper network and fixed wireless technologies.** The percentage of fiber network out of the fixed broadband penetration is minimal in Lebanon, Jordan, Iraq, and Syria.

**State-owned Iraq Telecommunications and Post Company (ITPC) is the incumbent provider of fixed line infrastructure in the country.** Iraq's high-speed Internet market is virtually non-existent, despite government plans for several FTTH deployment projects since 2014 that are primarily targeting the capital but also including other major cities, such as Basra. The number of fiber subscribers reached 68,000 in 2018, and their subscriptions are marketed by the government's private-sector partner, ScopeSky.

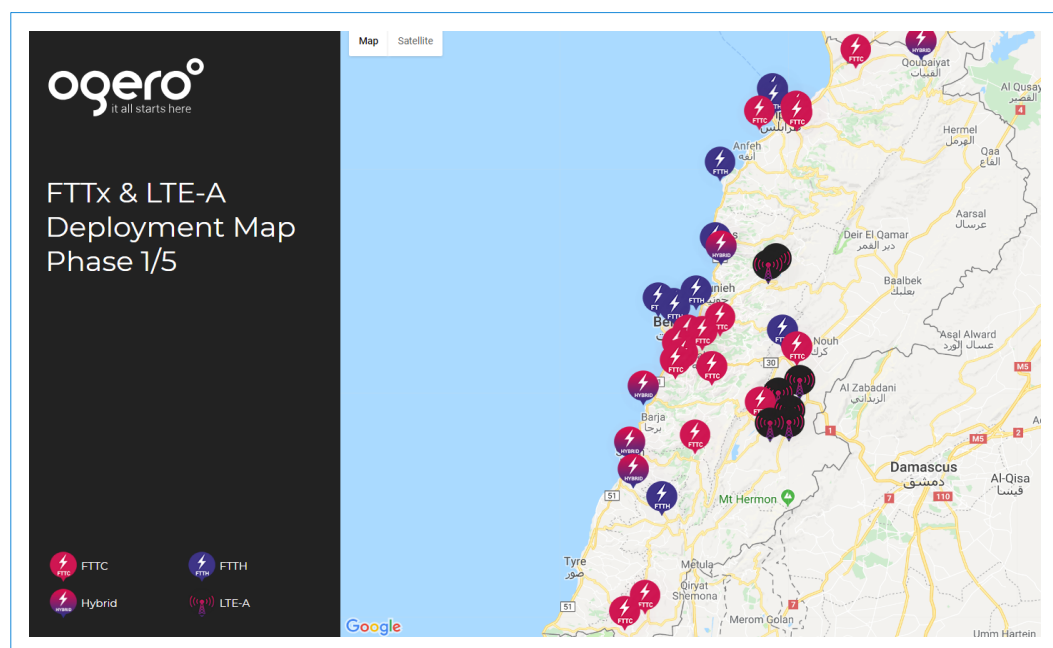
**In contrast to Iraq in general, the broadband sector of the semi-autonomous Kurdistan Region has, until recently, thrived.** Overseen by the Ministry of Transport and Communications (MTC KRG), the market is host to several WiMAX and LTE providers, and major cities in the region were also served by fixed DSL and fiber to the user (FTTX) networks. Following an independence referendum for the region held in September 2017, tension between the federal government in Baghdad and the Kurdish-based operators heightened, with threats of confiscation and disconnection of interconnection. The Baghdad authorities have put pressure on Kurdish providers, ordering the confiscation of their infrastructure in Kirkuk after Iraqi forces took control of the region in October 2017. For instance, the WiMAX provider Fanoos claimed in March 2018 that its fiber infrastructure in Kirkuk had been dismantled without its prior notification.

**Jordan is the most competitive Mashreq country in the deployment of fixed broadband infrastructure, technologies including WiMAX, ADSL and fiber networks.** The market is served by three universal operators; Zain, Orange, and Umniah. In addition to these operators, several ISPs are providing FTTH and other data communications services. Fiber networks are still geographically limited to certain areas of Amman. The gradual expansion, however modest, of fiber-based access networks in recent years has led to an increase in subscriptions, with the number of users connecting via the technology reaching approximately 22,000 at the end of 2017, compared to 14,100 a year earlier and 9,995 in December 2015. Orange Jordan dominates the market, despite recent increased competition in FTTX deployment from Umniah and Zain Iraq.

Orange Jordan is marketing FTTH subscriptions in the following areas: Fuhais, Al-Foroosieh, Al-Qastal, Al-Khaldi St., Taab Al-Kera'a (Shafa Badran), Sahab and Al-Wehdat (Yarmouk St., Price Hasan St., Sumayah St., Khalda, Um Al-Usood, Petra, Al-Salam-Al-Rabieh, East Tla'a Al'Ali, Al-Redwan, parts of Sweifieh, parts of Al-Barakeh, parts of Al-Saleheen, parts of Jabal Al-Hussein, parts of Al-Khaledeen, and parts of Aqaba.

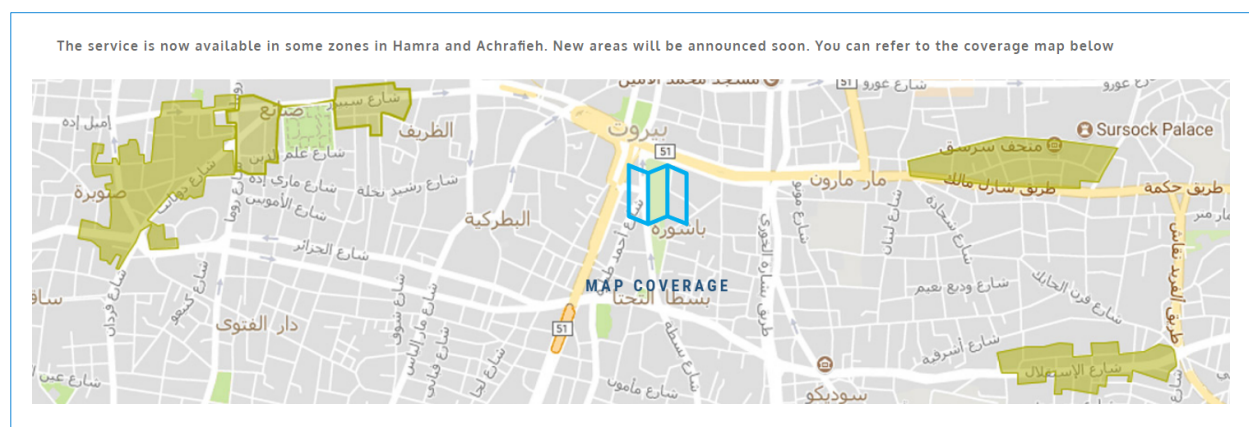
In Lebanon, the Ministry of Telecommunications, through its operating arm **OGERO**, has a monopoly in **fixed infrastructure deployment**. The ministry has recently announced major investment in a nationwide fiber. How the competition dynamic between the private operators and OGERO in providing FTTX services will unfold is uncertain, as the market is still in its nascent stage and the terms and conditions for the usage of OGERO's ducts are not clear.

**Figure 25: Fiber to the premises network plan in Lebanon**



Source: OGERO

**Figure 26: Fiber to the home services marketed by Globalcom Data Services (GDS) in Lebanon**



Source: GDS - <http://www.gds.com.lb/fiber.html>

There is a dearth of information on the fixed access networks in Syria. The country is believed to be home to more than a dozen operational ISPs, although Tarassul, owned by fixed line incumbent Syrian Telecom, continues to dominate the market, with around 41% of all end-user connections. Other ISPs with significant market shares are SAWA (29%), High & Fast Internet (13%) and RunNet (13%). Other players



together serve the remaining 4% of the market. Almost all access lines appear to make use of DSL technology.

**Iran has a fairly large number of different ISPs; however, the market is very much dominated by incumbent Telecommunication Company of Iran (TCI)** with nearly 80% of market share. In terms of technology, nearly 70% of all access lines rely on copper-based DSL. Still, around 28% of lines are already based on optical fiber. Wireless access based on WiMAX or Time Division – Long-Term Evolution (TD-LTE) plays only a minor role (with less than 3% of lines).

### Mobile access networks

**Regarding mobile broadband, most mobile networks in the Mashreq countries have been upgraded in recent years to 3.5G and 4G technologies. 4G network coverage is, however, still mostly concentrated in densely populated areas (Table 3 and Error! Reference source not found.).** While Lebanon has nearly 50% of mobile subscribers on LTE, other Mashreq countries typically have less than 20% of subscribers using LTE (an exception is MTN Irancell with 28% of customers on LTE).

**Table 3: Mobile network technologies in Mashreq**

Country	Company	Mobile network Generation	Date live	Coverage
Jordan	Orange Jordan	4G	2018	Feb-18: “heavily populated areas”, expanding to “all governorates” in due course
Jordan	Umniah	4G	2016	Feb-18: 80% (est.), presence in all governorates
Jordan	Zain Jordan	4G	2015	Feb-18: 92%
Jordan	Orange Jordan	4G	2018	Feb-18: “heavily populated areas”, expanding to “all governorates” in due course
Lebanon	Touch Lebanon (MIC2)	4G	2017	Jun-17: deploying 4x4 Multiple Input Multiple Output (MIMO)/256 Quadrature Amplitude Modulation (QAM) in dense urban areas (claiming “LTE-A Pro” <sup>41</sup> but unconfirmed)
Lebanon	Alfa (MIC1)	4G	2016	Jun-17: >94% (est.); Feb-17: >90% (company claim), with 200Mbps-250Mbps speed; demonstrated 300Mbps LTE-A on live network in Q3 2015
Iraq	Asiacell	3.5	2015	Nationwide
Iraq	Fastlink	4G	2013	Kurdistan
Iraq	Korek	3.5G	2014	Major Cities
Iraq	Zain Iraq	3G	2015	85% coverage
Syria	MTN Syria	3.5	2016	Dec-17: 65%; includes coastal areas and Damascus
Syria	SyriaTel	3.5G	2015	Dec-17: Damascus and the surrounding area

Source: TeleGeography, 2018

<sup>41</sup> Long-Term Evolution-Advanced Pro.

**Table 4:** Population coverage of 3G and 4G networks in the Mashreq region

Country	Technology	Population Coverage
Iraq	3G	80%
Jordan	3G	99%
Lebanon	3G	99%
Syria	3G	78%
Iraq	4G	25%
Jordan	4G	95%
Lebanon	4G	95%
Syria	4G	0%

Source: TeleGeography, 2018

## E. Conclusion

**The Mashreq region has a strategic geographic position with respect to global Internet infrastructure.** The strong growth in global bandwidth demand, driven by the diffusion of Ultra-Fast Broadband in all regions, as well as the development of data-intensive and video services and applications are major drivers. The Mashreq is also at the crossroads of the highest growth segment of global data connectivity, the Europe-Asia Internet traffic route, and already has access to main sea cable links.

**The Mashreq countries could capitalize more on the strategic access to major sea cable links through further liberalization of international gateways and IXPs.**

**National backbone networks in the Mashreq countries are mostly managed and operated by incumbent fixed operators.** Evidence from various ISPs and alternative operators suggests that service prices on these national backbone networks are considered too high and may require stronger regulatory (price) intervention to stimulate the growth of national broadband markets.

**In terms of access markets, most Mashreq countries still rely heavily on DSL technology, which strongly limits the expansion of broadband services.** The main alternative is fiber-based access offering the highest possible bandwidth. Fixed-wireless solutions based on LTE technology provide a more cost-effective solution. Still, access service providers will need to rely on competitively priced backhaul service to provide affordable services to end-users.

**For most users in the Mashreq countries, mobile broadband is the main or even only form of access to the Internet and other broadband services.** Here, 4G technology offers a strong potential for expanding service bandwidth and quality. Besides licensing additional spectrum for further network expansion, the main bottleneck for further rollout of 4G access will be affordable backhaul links based on fiber optic cables.

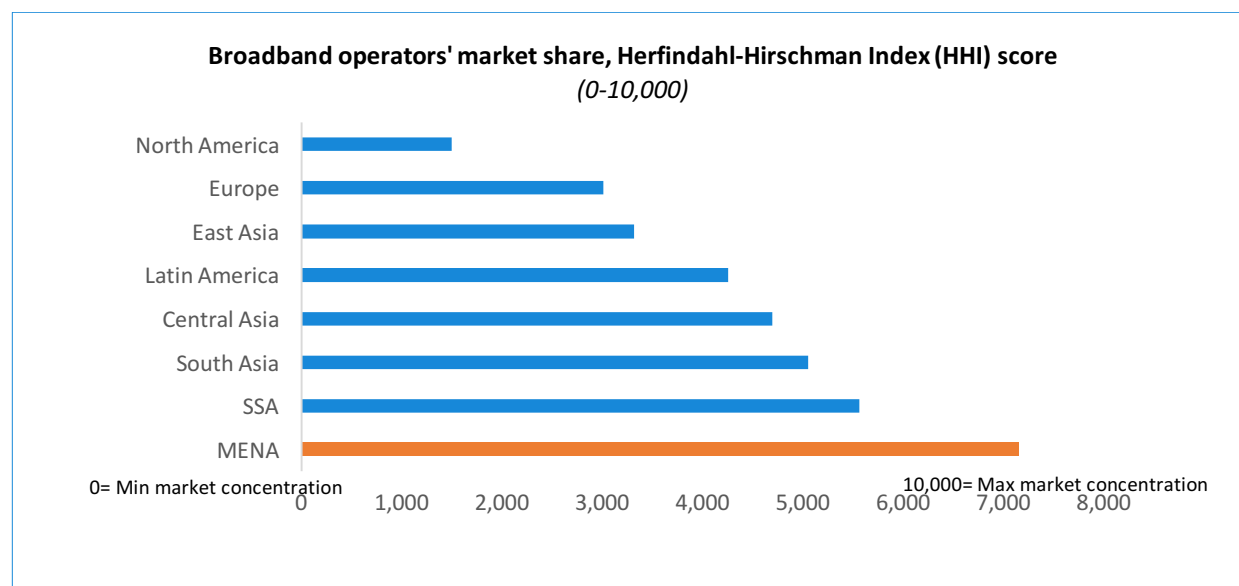
## V. What are the main obstacles to digital infrastructure development in the Maghreb?

### A. Market concentration and political economy of state-owned enterprises (SoEs)

The MENA countries, including those in the Mashreq region, have the most concentrated broadband market in the world. This is particularly the case in the backbone and international connectivity segments of the value chain. All the Mashreq countries, with the exception of Jordan, have *de jure* monopolies over investment in and deployment of international submarine cables and terrestrial fiber optic networks (Figure 27). In addition, in these countries the monopoly is exercised either directly by the Government (MoT in Lebanon), or by SoEs (Iraq and Syria). These SoEs represent a considerable drag on sector development. The question of opening the sector to competition and/or restructuring and privatizing the SoEs has been raised and considered in Lebanon and Iraq for over a decade now. Even in the mobile markets, which, with the exception of Lebanon, are open to competition, there are tight oligopolies and power sharing in the market between two main players, including the incumbent operators.

Tight oligopolies are often associated with high economic rents and thus a higher level of corruption. The impact of corruption on the development of the market can be seen from the high correlation between the Corruption Perception Ratio (CPR) and international bandwidth use per capita (Figure 28).

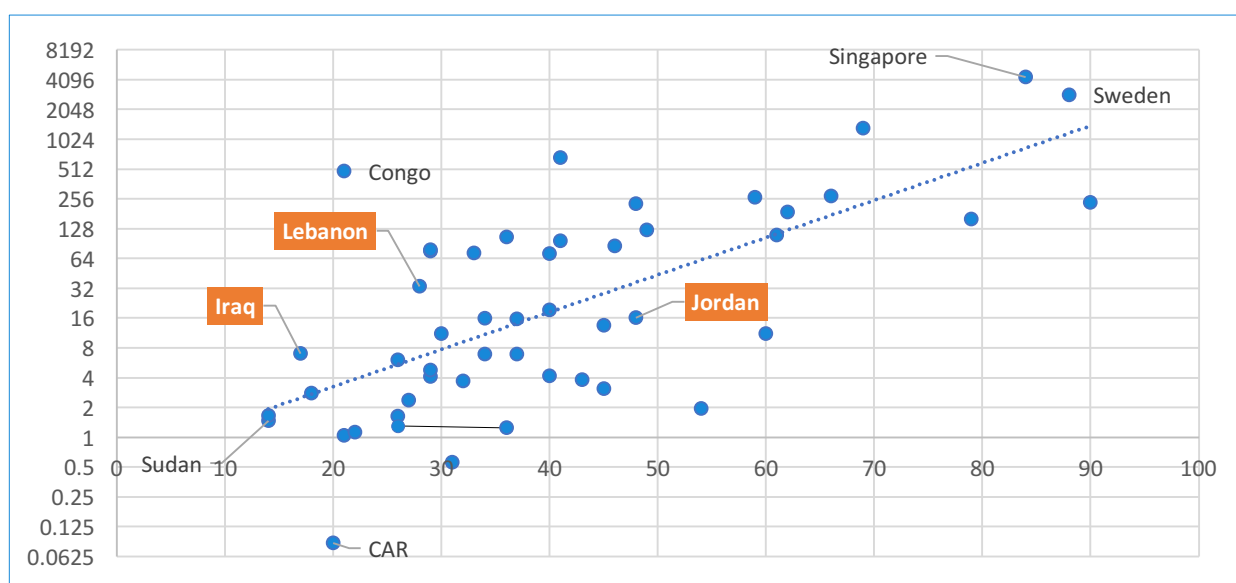
Figure 27: Market concentration in MENA



Source: Economist Intelligence Unit



**Figure 28: CPR and bandwidth use per capita**



Sources: World Bank, ITU, and Authors

Bringing incumbent telecom operators in the Mashreq to a level of efficient operations (except for Orange in Jordan, which was privatized many years ago), would involve workforce reductions of the order of 30–50%. As this sector employs typically no more than 1-2% of a country’s workforce, it would be an isolated shock, compensated by growth in jobs in the digital space, and by an increase in subcontracted jobs. This would involve a shift in the composition of labor. For this reason, privatization and incumbent operator reform is rarely tackled or discussed in public fora. Operators such as ITPC in Iraq are overstaffed and resist reform, creating bottlenecks to the development of the digital economy. However, reform of incumbent operators can be advanced through next generation public-private partnerships, which emphasize a “risk sharing” (as opposed to “risk shifting”) approach and can create “win-win” situations for the incumbent and for the market.<sup>42</sup>

## B. War and destruction

Fighting has had a serious toll on Syria’s and Iraq’s telecommunications networks. In many of the areas affected by conflict, mobile towers were destroyed. Moreover, the lack of electricity supply has also severely affected tower operation and therefore mobile connections as well. Similarly, cuts and destruction to the fixed network assets resulted in intermittent Internet access and a complete shutdown

<sup>42</sup> Governing Institute. 2016. Issues Brief: “How Next-Generation Public-Private Partnerships Help Governments Share the Risk of Infrastructure Investment.” Available at: <http://www.governing.com/papers/How-Next-Generation-Public-Private-Partnerships-Help-Government-Share-the-Risks-of-Infrastructure-Investment-8667.html>.

in some areas. All these factors raised the cost of maintenance and operations and thus affected the provision of communications.

MTN Syria reported that due to problems in maintaining adequate power supplies, around 50% of its base transceiver stations (BTS) in the country were out of commission by end-2013. As of 30 November 2016, the company advertised 2G and 3G coverage of 75% and 60%, respectively. Meanwhile, roughly 1,197 of ST's cell sites were unrestored at that same date.

The Syria-Turkey cable was reportedly damaged in August 2013, following intense fighting in the city of Saradiq, through which the fiber optic cable linking Aleppo to Turkey passes.<sup>43</sup> In addition, national connectivity between Aleppo and the interior cities of Syria was damaged. In the absence of infrastructure to connect Aleppo to the rest of the country and to the international Internet network, the city was not connected to the Internet through the official government network for an extended period. It was not until 2015 that the incumbent operator ST was able to reinstate international connectivity to part of Aleppo through a high capacity microwave link to Damascus and thereafter to the coastal city Tartous that harbors Syria's international cable landing station. Most recently in October 2016, ST completed a new fiber optic link from Aleppo to the national core network in Damascus, thus reinstating national and international connectivity to government-controlled areas of Aleppo.<sup>44</sup>

In Iraq and Syria, a new network of communications infrastructure and service providers has emerged servicing ISIS for its own communication needs, and social media reports examined under this assessment have revealed some concerns over the possible emergence of unlicensed operators in ISIS-held areas.

An assessment of the damages in Iraq estimates the repair and replacement cost for damages sustained by the mobile network operators (all are private operators) to be approximately IQD 100 billion (US\$85 million), inclusive of service delivery restoration costs. In terms of the state-owned fixed backbone network, it is estimated that a total of IQD 660.5 billion (US\$558.8 million) will be needed to build a state-of-the-art and robust fixed network in the affected areas.<sup>45</sup>

## C. Political isolation

The state of conflict between the Mashreq countries and Israel, on one side, and Iran, on the other, is a constraining factor for the potential growth of digital infrastructure in the Mashreq. War and destruction have impaired JADI (Jeddah-Amman-Damascus-Istanbul), a major existing backbone network, and Israel's isolation has jeopardized the potential of the AMEER network. The substantial digital infrastructure of Iran is only partially utilized, despite the great commercial interest that brought operators like Turk Telekom

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<sup>43</sup> Madory, Doug. 2016. "War-torn Syrian city gets new fiber link." Oracle Dyn Blog. October 12. <http://dyn.com/blog/war-torn-syrian-city-gets-new-fiber-link/>.

<sup>44</sup> TeleGeography. 2016. "STE deploys fiber-optic link in Aleppo." October 13. <https://www.telegeography.com/products/commsupdate/articles/2016/10/13/ste-deploys-fibre-optic-link-in-aleppo/index.html>.

<sup>45</sup> World Bank Group. 2018. *Iraq Reconstruction and Investment, Part 2: Damage and Needs Assessment of Affected Governates*. (Washington, DC: World Bank), p. 83. <https://openknowledge.worldbank.org/handle/10986/29438>.

International and Telecom Italia to establish points of presence in Iran and link Iran's infrastructure to Europe and Asia through the Europe-Persia Express Gateway (EPEG) network.

More broadly, the respective geopolitical considerations around Israel and Iran show large opportunity costs for the digital transformation of the Mashreq. In the absence of geopolitical considerations, the startup scenes in Beirut and Amman would be fully integrated with Tel Aviv and the other startup hubs in Israel, becoming a regional hub able to rival Silicon Valley or European centers such as Stockholm and Berlin. Fully integrating the Mashreq technology scene with Iran's buoyant technology and industrial sectors would give access to firms in the region to one of the fastest growing markets in the world.

The above-mentioned political isolation results in disruptions to physical networks, as well as in missed opportunities to leverage networks of technologist communities and to develop and address markets together as a single integrated region.

## VI. Cross-sectoral digital applications

This chapter explores the various vertical applications that digital infrastructure and connectivity enable and that are and can be used to advance the socioeconomic development of developing and emerging economies. These verticals cover many sectors and services, such as health, agriculture, education, energy, livelihoods, financial inclusion, and disaster relief, among others. For instance, in agriculture, established and emerging technologies can help achieve food security, improve the livelihoods of smallholder farmers, and improve agricultural efficiency. E-health can improve the provision of health services for remote communities and enable coordination and knowledge transfer across countries. The interplay between energy and connectivity and ICT is essential to tackle the problems of energy access and efficient use of energy resources, as well as to improve collections of usage fees. While countries like Jordan, Lebanon, and Iraq have relatively high levels of smartphone usage, relatively well-positioned IT services, and high levels of skilled labor, the available technologies have not yet been translated into **digital dividends** for most of the Mashreq people. Leveraging disruptive technologies could play a catalytic role in placing ICT at the core of the development efforts of the region. This chapter focuses on the people-centered applications that are most relevant to the problems and challenges faced by the Mashreq region. It presents the main trends, the technological frontiers, and use cases in these sectors, give some examples when available, and proposes to embed appropriate and sustainable digital solutions in World Bank programs while maximizing quick gains and leapfrogging opportunities in the Mashreq countries.

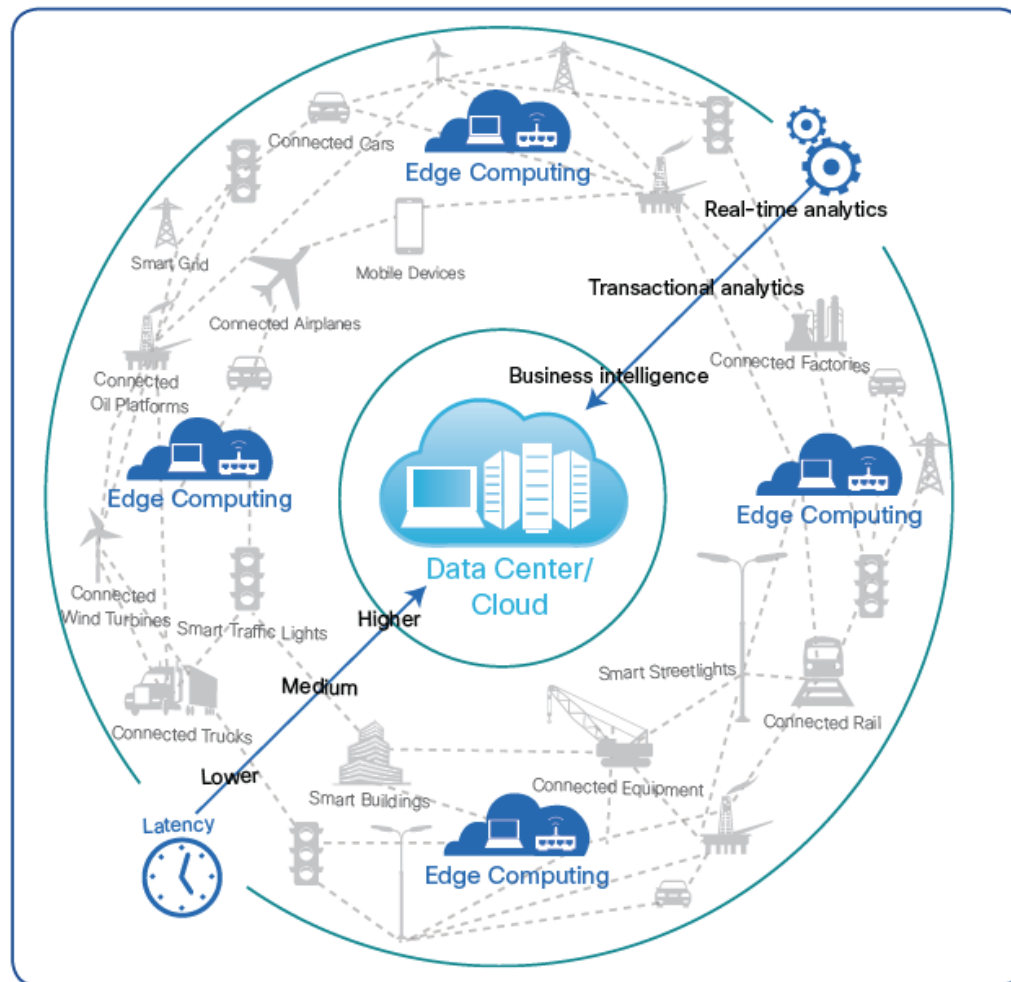
### A. Energy

#### *Expanding broadband connectivity through energy infrastructure:*

Sharing of passive infrastructure between telecommunications operators and other utilities such as electricity is one of the major ways to lower the cost of fiber network rollout. The most common case of network sharing across sectors is between telecommunications providers and electricity networks because power companies are themselves users of communications services to operate and control their networks and services. Infrastructure sharing with electricity networks originally started with optical power ground wire (OPGW) installed on high-voltage transmission lines. OPGW functions as the electrical ground wire of the network but also carries optical fibers that constitute an independent telecommunications system. These OPGW cables are installed only on high-voltage power lines and can be leased to broadband network operators to connect regional networks. However, broadband services over power lines are becoming more possible in the distribution network due to new cable technologies. These include cables that can be installed on low- and medium-voltage poles such as All Dielectric Self-Supporting Cable (ADSS), an independent fiber optic cable, and Optical Phase Conductor (OPPC), all mixed phase/optical conductors. With these new cable technologies, broadband operators can lease capacity from electricity companies and provide FTTH over power lines at a much cheaper cost than deploying underground cables.

**Figure 29: Digital Disruption of Infrastructure**

Edge computing helps ensure that the right processing takes place at the right time and place.



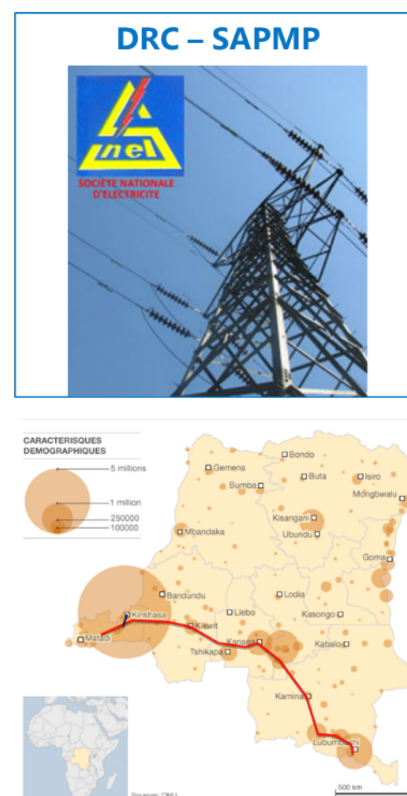
Source: Cisco, 2014

The concept of sharing between utilities is not new; however, these arrangements are often difficult to implement due to legal and regulatory barriers of sharing across sectors or the unwillingness to share infrastructure by other utilities. In certain European countries, such as Lithuania, Portugal, and Bulgaria, regulated access to other utility ducts is not very efficient primarily due to the absence of reasonable access prices and the lack of dispute resolution procedures. On the other hand, commercial agreements in France, the Netherlands, and Luxembourg led to the deployment of fiber networks with the use of railroad, motorway, and energy infrastructure. In France, 37% of optical fibers are deployed using *Électricité Réseau Distribution France* (ERDF), the national public electricity distribution network. This sharing comes under a national project “France Très Haut Débit” that brings together ERDF, local authorities, operators, and regulators. The success of this sharing arrangement can be attributed to the reliability of the electricity infrastructure and a standardized agreement model with clear charges, rights, and obligations. A recent example of the commercialization of a fiber optic network deployed over optical ground wire and financed by the World Bank Group through its Southern Africa Power Market Project

(SAPMP) is the network of *Société Nationale d'Électricité* (SNEL), the electricity company in the Democratic Republic of Congo (DRC); a full description of the project is detailed in Figure 30.

**Figure 30: Use of electricity network for backbone deployment in DRC**

- Under SAPMP, the Government of the Democratic Republic of Congo (DRC) has rehabilitated the high voltage power line network from Inga's hydropower plants to Kasumbalesa (3,300 km) by installing a fiber optic telecommunications system (OPGW) and has expressed its intention to commercialize the excess capacity of the aerial fiber optic cable infrastructure of the Société Nationale d'Électricité (SNEL).
- In 2015 a competitive and transparent tender process was launched: a concession contract to a telecommunications service provider that will leverage SNEL's aerial fiber optic network to provide national long-distance wholesale bandwidth transmission services across DRC on a commercial basis.
- Three investors, Airtel Congo DRC, Vodacom Congo (DRC), and Liquid Telecommunications Operations, signed three contracts of "Indefeasible Rights of Use" (or "Irrevocable Right of Use" – IRU) of the excess SNEL capacity for a period of 15 years and amounting to US\$7,633,800.
- Apart from an immediate gain of nearly US\$23 million, the cost of maintaining the entire network will be the responsibility of IRU contract awardees and they will have to rent space during the contract period.
- This marketing of black fibers (US\$2,605 per pair of optic fibers and per kilometer) makes it possible to grant SNEL additional revenues that are essential because of the maintenance of a "political" price for electricity, which does not allow it to make the necessary investments in the production and distribution of electricity within the required time.
- It also makes it possible to prepare SNEL to transition to new businesses (capacity sales, etc.) by creating a trial period for the staff that are managing this new telecommunications business.












Source: World Bank Group

### ***Innovative Internet of Things (IoT) services for more efficient energy consumption***

At the energy consumption level, digital technologies enable power companies and consumers to manage consumption during peak times, reducing inefficiencies and therefore costs. Advanced metering infrastructure (AMI) is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers. The system provides several important functions to automatically and remotely measure electricity use, connect and disconnect service, detect tampering, identify and isolate outages, and monitor voltage with new IoT connected devices. AMI also enables utilities to offer customers new time-based rate programs and incentives that encourage customers to reduce peak demand and manage energy consumption and costs. For instance, in Senegal a new service is being launched under the name AKILEE that is connected to customers' appliances and devices to provide users with recommendations on how and when to reduce consumption and thus electricity costs. Digital applications and innovative services in the energy sector require, however, a reliable connectivity and infrastructure between the household/premises and the electricity company, as well as access by the end-user to broadband services on the go to manage services

and consumption patterns. Figure 31 shows various World Bank projects at the intersection of connectivity/digital technologies and energy in Africa.

**Figure 31:** List of World Bank energy projects integrating technologies

Project	Activity	Approval Year	Allocation to Digital
 Kenya Electricity Modernization Project	Revenue protection through smart and pre-paid metering	2015	\$40M
 Nigeria Electricity Transmission Project	SCADA and telco systems for smart grid expansion	2018	\$65M
 Ghana Energy Development and Access Project	Revenue protection through smart and pre-paid metering	2015	\$32.5M
 Philippines Access to Sustainable Energy Project	Revenue protection through smart and pre-paid metering	2016	\$0.1M
 Niger Electricity Access Expansion Project	Revenue protection through smart and pre-paid metering	2016	\$4M
 Pakistan National Transmission Modernization Project	Enterprise Resource Planning (ERP) systems for smart grid expansion	2018	\$29.5M
 Mozambique Power Efficiency & Reliability Improvement Project	Revenue protection through smart and pre-paid metering	2018	\$6.3M
 Madagascar Electricity Sector Operations & Governance Improvement Project	New dispatching center and distribution control center for the Antananarivo interconnected network	2018	\$12.5M
 West Africa Transmission Expansion Project	SCADA for cross-border exchange	2017	\$4.4M

Source: World Bank

Note: SCADA = Supervisory Control and Data Analysis

#### **Potential programs that can leverage digital infrastructure in the energy sector**

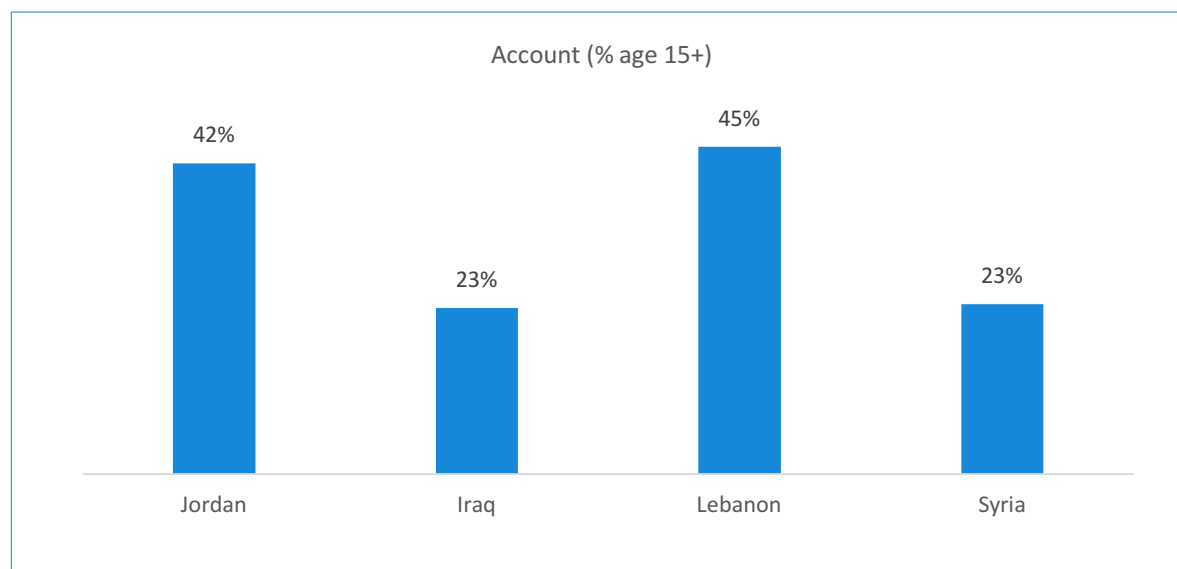
- Leveraging the reconstruction of infrastructure in Mosul in northern Iraq to develop a state-of-the-art fiber optic network while building on the synergies and cost savings of the mutualization of the electricity/railway and other utilities;
- Improving efficient collection of electricity service usage fees in Lebanon and Iraq;
- Improving the consumption of energy in all countries through the development of IoT services.

## **B. Financial inclusion**

Access to finance and of financial services is key to the development of entrepreneurship, job opportunities, growth of SMEs, integrating people in the formal economy, and reducing socioeconomic and geographic disparities. Access to financial services is also core to the management of disaster relief situations and the continual support of refugees. Global Findex (<https://globalfindex.worldbank.org/>) data (Figure 32) for the Mashreq countries points to a large unmet demand for financial services. More than 50% of the adult population in Jordan and Lebanon do not have access to a financial account; this percentage goes up to more than 75% in Syria and Iraq. These figures suggest that there is a latent unmet demand across the Mashreq countries, including in countries with relatively more active financial markets.



**Figure 32: Financial accounts in the Mashreq Countries**



*Source: Global Findex, 2018*

In recent years digital finance has been one of the main channels of increasing financial inclusion in developing countries. As defined by the G-20 High-Level Principles for Digital Financial Inclusion, the term “digital financial services” (DFS) refers to financial products and services, including payments, transfers, savings, credit, insurance, securities, financial planning, and account statements. These services can be delivered via digital/electronic technology, including through a payment card, online, or via a mobile phone.

The use of digital payments, especially through mobile money services, is on the rise. The share of adults around the world making or receiving digital payments increased by 11 percentage points between 2014 and 2017. In developing economies, the share of adults using digital payments rose by 12 percentage points to 44%.

Mobile money provides individuals with a seamless and easy way to receive, send, and borrow money, remotely and with little established credit history. It facilitated the know your customer (KYC) identification and verification process for lenders and transactions between firms, their customers, and suppliers. Digital financial services have also been used by governments to increase efficiency and accountability in various payment streams, including for the disbursement of social transfers and receipt of tax payments. Digital financial services can also help people manage financial risk by making it easier for them to collect money from distant friends and relatives when times are tough. In Kenya, researchers found that when hit with an unexpected drop in income, mobile money users did not reduce household

spending, while nonusers and users with poor access to the mobile money network reduced their purchases of food and other items by 7–10%.<sup>46</sup>

The technologies and business models underlying the mobile money industry are well established now, but their applications are becoming even more pervasive and indispensable to many people who did not have access to financial services before. Unbanked farmers for instance could benefit from the security and convenience of digital payments for agricultural sales. Digitizing agribusiness supply chains could also build payment histories and help expand access to credit and insurance for small farmers. Mobile and digital payments are also increasingly being used by international donor communities for direct transfers to refugees and their host communities.

## C. E-government and renewing the social contract

Governments can leverage digital platforms to offer citizens government services, such as tax payment, driver's license renewal, identity validation, and business registration, among others. Governments can also use an online presence to share information and receive feedback from citizens and businesses. These platforms can be citizen-facing but also run through digital intergovernmental networks and databases to render government functions more efficient and less costly.

Governments can also enter public-private partnerships to develop government platforms so that these platforms can be managed, operated, or cofinanced by private partners. For instance, the Hashemite Kingdom of Jordan identified digital development as a high priority for the country's social and economic development. Jordan formulated a comprehensive digital economy strategy, Reach 2025<sup>47</sup> with a vision to "have a digital economy that empowers people, sectors and businesses to raise productivity and ensure growth and prosperity, creating a highly attractive business destination for investments and international partnerships." Jordan also committed to the launch of the World Economic Forum "Internet for All Initiative" in 2017. This initiative aims to ensure inclusive digital development and focuses on creating opportunities for economic growth and jobs across the Kingdom. It also focuses on digital government and using digital infrastructure to increase work efficiency, improve work mechanisms, and promote socioeconomic development. In this context, the Government of Jordan asked for World Bank support to provide technical assistance to explore options to design and tender a comprehensive broadband and digital platform Public-Private Partnership (PPP).

**In order to develop robust digital platforms, Mashreq country governments would require the following:**

- **Service delivery:** Governments may opt to use digital channels (such as online portals, mobile phones, social media) to offer citizen- or client-facing government services. By offering digital services, governments can improve the cost and efficiency of such services, while offering greater ease and convenience to people, businesses, or government. These digital services cover all aspects of a person's or a firm's life. For a person's life, digital services span from cradle to death,

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<sup>46</sup> Jack, William, and Tavneet Suri. 2014. "Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution." *American Economic Review*, Vol. 104, No. 1, pp. 183-223.  
<https://www.aeaweb.org/articles?id=10.1257/aer.104.1.183>.

<sup>47</sup> <http://www.reach2025.net/>

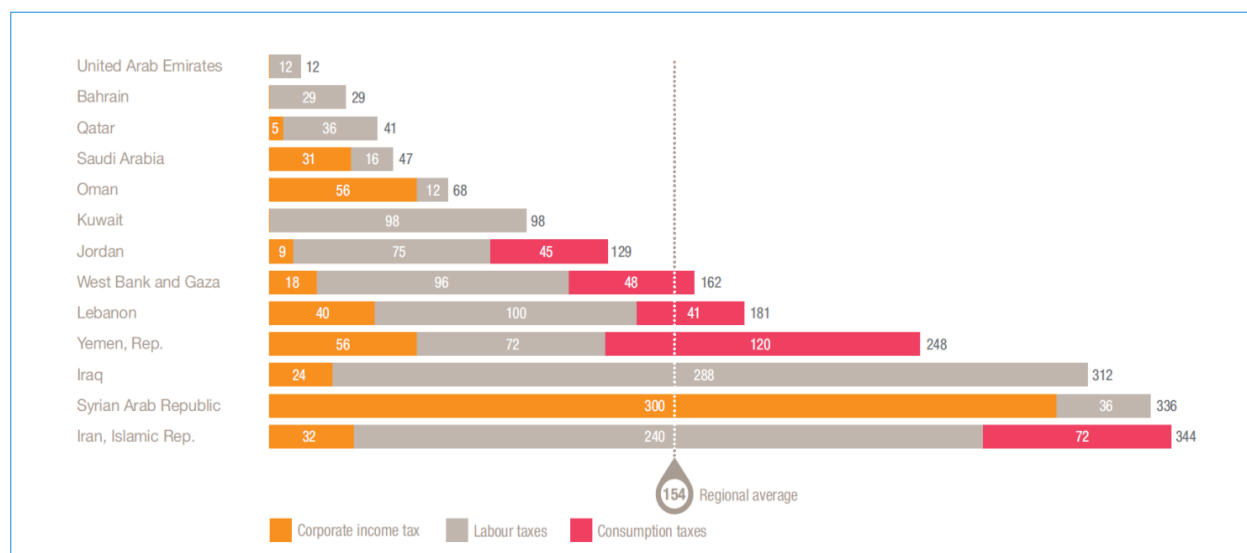
including birth registration, digital identification, education, healthcare, driver's license, taxation, vehicle registration, property registration, pension, social security, social protection, and death registration. For a firm's life, digital services span from starting to closing a business, including business registration, taxation, capital raising, initial public offering, financial reporting, and bankruptcy filing. Increasingly, design thinking is being adopted by governments to offer more user-friendly government services via digital channels.

- **Shared services:** To be as efficient as a corporate enterprise (also known as “whole of government approach”), governments may need to set up shared services for use across government agencies at the federal, state, and/or local levels. Shared services help remove duplication and redundancy in cost and effort across disparate government agencies, streamlining processes while improving economies of scale. Shared services include government clouds or data centers, connectivity networks, payment networks, online portals and content management systems, and certification authorities or public key infrastructure.
- **Data infrastructure management:** With more data becoming digital, governments need to use digital facilities to source, store, and share information with all constituents. Re-usable public sector data or open data is not only a tool to keep government accountable, but also a resource for startups and firms to offer innovative products and services. Big data analytics, when combined with publicly- and privately-held data upon availability provides inputs to policymakers to design new programs catering to the individual needs of citizens.
- **Back-office systems:** Governments use digital facilities to manage and operate their back-office systems for day-to-day operations. These systems cover all aspects of a government's functioning in its role as a corporate enterprise, including financial accounting, payroll, human resource management, general administration, and procurement.

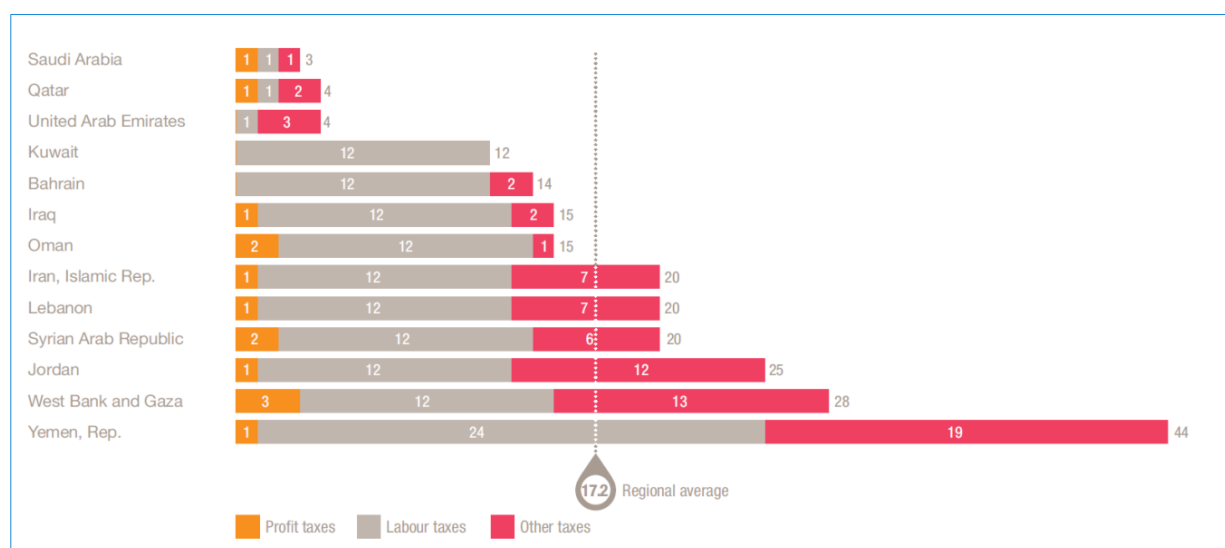
### ***Potential programs that can leverage digital infrastructure in the government to citizen sector***

- **E-taxation:** improving tax collection times and tax compliance rates in Lebanon and Iraq

**Figure 33: Time to comply (hours) in Middle East**



**Figure 34: Number of payments in Middle East**



## D. Multi-sided platforms (MSPs), regional trade, and logistics

Digital infrastructure and ICT can help increase the overall enabling environment for enhanced economic cooperation and trade integration in the Mashreq. There is a large opportunity for digital services trade. There is a strong opportunity for the mobile app and software markets to grow beyond national borders and create greater value-added at a regional level, benefiting from larger economies of scale. However, the region is lagging the world in crowdsourcing, which could otherwise have a great potential for job creation through ICT-enabled trade of professional services. There is limited scope for trade in hardware or to develop a hardware industry for export purposes.

### Box 1: E-Commerce and Digital Platforms in Iraq

Although e-commerce could prove a great boon to the standard of living in Iraq by allowing Iraqi citizens to compare goods to find reasonable market prices, enabling more foreign goods and commodities to be sold and creating a more transparent market, e-commerce has been growing slowly in the country for several reasons, including low Internet penetration and Internet speed. Internet service is also disrupted by a poor power supply and heavy restrictions on service providers. Another big problem contributing to the slow growth of e-commerce is the low level of literacy among the Iraqi population. Only about 80% of the population can read or write, and the ability to read and write English, the primary language of trade and e-commerce, is much lower. Perhaps the greatest problem hindering e-commerce, however, is the preference for cash. There are many reasons for this preference: distrust of Iraqi banks, scarcity of credit card products, and the desire for anonymity for tax evasion purposes. The most popular Iraqi and MENA-focused e-commerce websites include Kurdshopping.com, Opensooq.com, Dasy2.com, Mredy.com, and Kurdsale.com

In terms of digital platforms, an Iraqi startup, Magnitt, has developed a data platform for investors. The platform currently hosts 5,500 startups and over 12,000 users including 300+ individual investors and 150+ funding institutions.

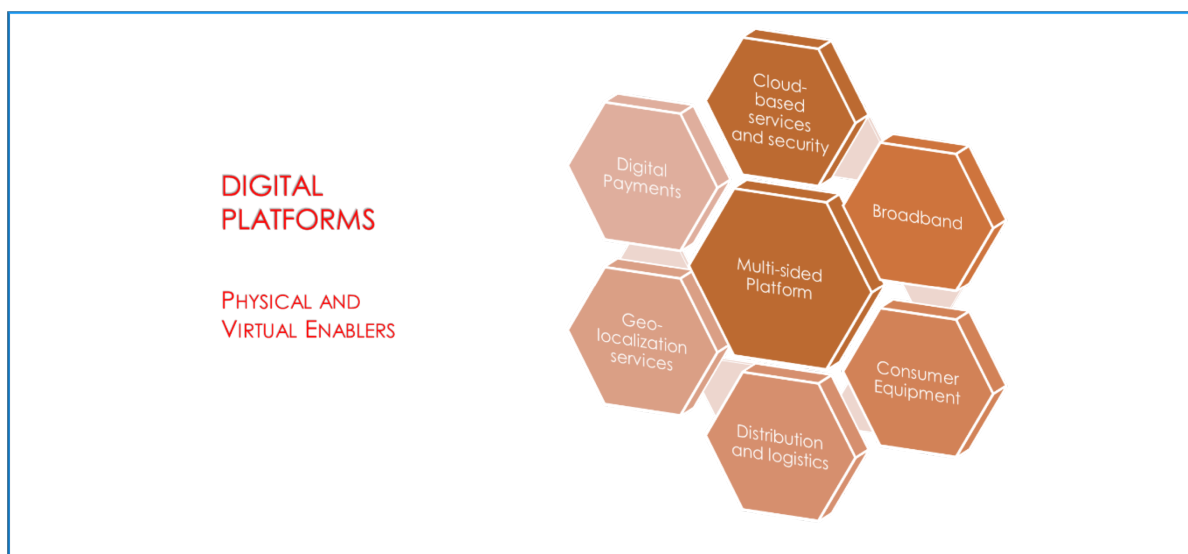
Connectivity helps connect, innovate, and transform local trade regimes; they create the necessary enabling environment for trade to flourish. Connectivity enhances virtual platforms for outsourcing and offshoring activities. Innovation lends itself to the development of new hybrid goods and services across industries by harnessing the power of communication technologies. Transformation happens through the development of digital platforms that can facilitate the administration of trade processes for businesses and governments.

***Potential programs that can leverage digital infrastructure for facilitating trade:***

- Incentivize the development of digital private platforms across countries;
- Integrate special industrial zones with domestic industries through IT platforms;
- Develop virtual hubs for software development, mobile apps, and gaming;
- Facilitate the exchange of skilled labor in ICT; and
- Enhance cooperation between academic institutions and industry.

From this perspective, digital platforms, both government-led, such as promotional trade platforms, and private-sector driven (so-called multi-sided platforms, or MSPs), promote an expansion of markets both within and across countries. Digital platforms require physical and behavioral enablers (Rossotto et al, 2018a). Physical enablers include digital infrastructure (broadband, fixed and mobile Internet networks), smartphones, laptops and other consumer equipment, payment tools, geo-localization, cloud services, security, and ancillary enablers (e.g., distribution, logistics, intermediary goods).

**Figure 35: Digital Platforms – Physical and Virtual Enablers**



*Source: Rossotto et al, 2018a*

In addition, market and behavioral enablers are essential for MSP dynamics. Consumers shift their core attitudes from buying goods to accessing services and “servitized” products (access-based consumption), leading to a peer-to-peer economy where platforms increasingly mediate interactions, typically

coordinated by peer-based trust relationships. Digital platforms may be able to exempt themselves from some type of liability, but regularly intervene when trust-based mechanisms encounter issues (for example, eBay refunds the buyer in case of a fraudulent transaction). Moreover, individuals casually participate in economic activities through privately-owned resources (assets, labor), which would otherwise remain idle.

**Figure 36: Digital Platforms – Market and Behavioral Enablers**













Source: Rossotto et al, 2018a

The interplay of physical and behavioral enablers, an evolutive process, is leading to the emergence of MSPs in the Arab countries of the Mashreq and in Iran, as summarized by the figures and tables below.

**Figure 37: Digital private sector platforms**

Digital lifestyle	Middle East offering	Users (million)	Global leaders	Users (million)	Asian leaders	Users (million)
Search	-	N/A	Google	1,400	Baidu 百度	300
Social media	-	N/A	Facebook	1,712	WeChat 微信	829
Communication	-	N/A	WhatsApp	1,000	WeChat 微信	1,120
Video	-	N/A	YouTube	1,000	youku 优酷	500
Music	anghami	24	Spotify	100	K	800
E-commerce	SOUQ.com	6	amazon.com	304	Alibaba.com	434
Payment	CASHU	1	PayPal	179	支付宝	300
Online fashion	NAMSHI	5	zalando	18	ZALORA	5
Travel and hospitality	-	N/A	airbnb	50	tulia 途家	40
Job market	bayt	18	LinkedIn	450	dajie 大街	32
Transportation	CAREEM	4	UBER	8	滴滴	250
Education	skill academy	8	COURSERA	17	沪江	110
Social commerce	colaba	3	GROUPON	50	美团	20

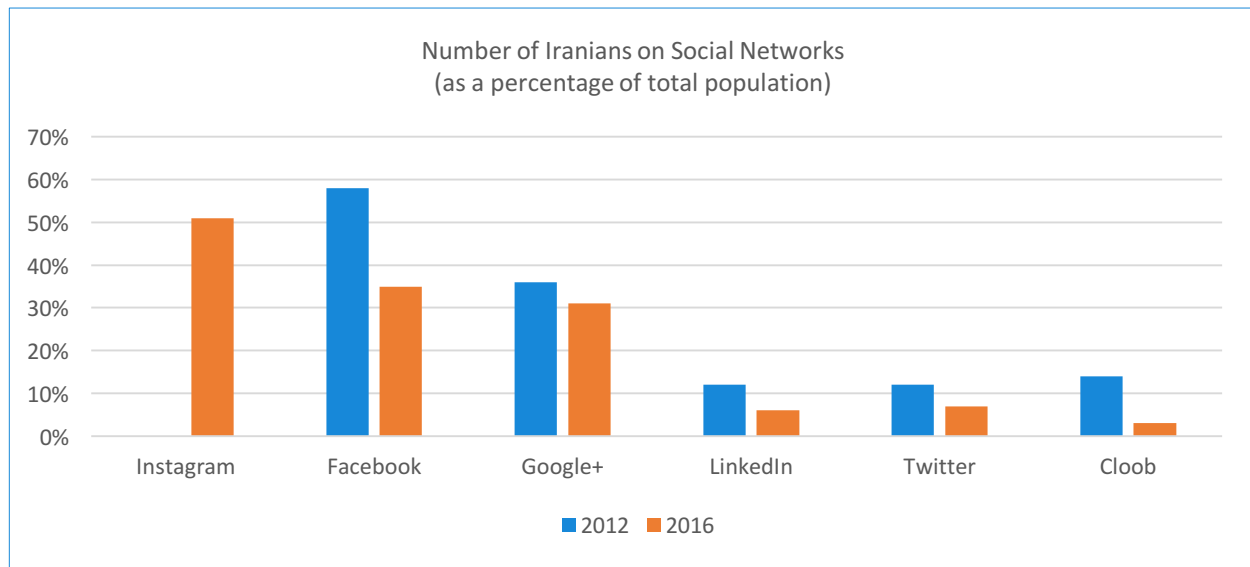
**Table 5:** Multi-Sided Platforms in Mashreq Arab Countries

Name of MSP	Logo	Country of Origin	Countries of operation
Arab Net news.arabnet.me		Lebanon	GLOBAL
Jaleesa <a href="http://www.jaleesa.co">www.jaleesa.co</a>		Lebanon	LEBANON
Nymgo <a href="http://www.nymgo.com">www.nymgo.com</a>		Lebanon	GLOBAL
Aumet		Jordan	Global
Abjjad		Jordan	MENA
Kharabeesh		Jordan	MENA
CashBasha <a href="http://www.cashbasha.com">www.cashbasha.com</a>		Jordan	MENA
OpenSooq.com <a href="http://www.opensooq.com">www.opensooq.com</a>		Jordan	All Arab Countries
liwwa <a href="http://www.liwwa.com">www.liwwa.com</a>		Jordan	Jordan UAE
MAGNiTT <a href="http://www.magnitt.com">www.magnitt.com</a>		Iraq	MENA

Source: Authors








**Figure 38: Social Networks in Iran**



Sources: TechCrunch, Jeremy Ellsworth/Edoramedia

**Table 6: Digital Platforms in Iran**

Name	Logo	Sector	Data
Café Bazaar		Local alternative for Google Play Store	32 million downloads on local smartphones
Snapp		Ride-sharing business	3 million downloads as of end 2017
Aparat		Video-sharing	Most visited website in Iran; 10.5 million videos per day
Digikala		E-commerce	Third most visited website in Iran
Diwar		Classified ads	Largest online classified ad platform; reaches over 50 cities and has expanded into Afghanistan

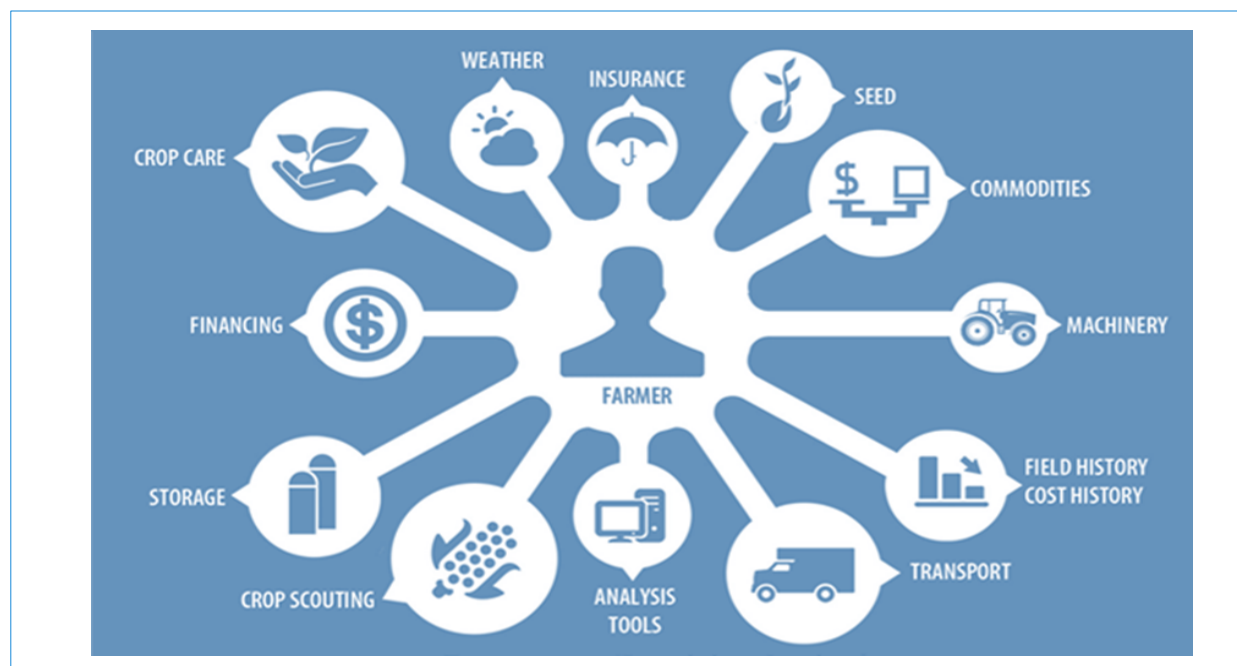
Source: Lavan Marketing Agency

## E. Agriculture

Mobile devices and remote sensors provide a platform that is reversing the asymmetric information flow for rural and small farmers and increasing their access to price information and to extension services. Digital services are not only helping to bring efficiencies to each stage of the supply chain and farm to market services such as logistics, access to credit, and crop insurance, but they are also helping agricultural producers move up the value chain: for example, by supplying market access for organic and cosmetic products that meet European Union and United States standards. Other applications include:

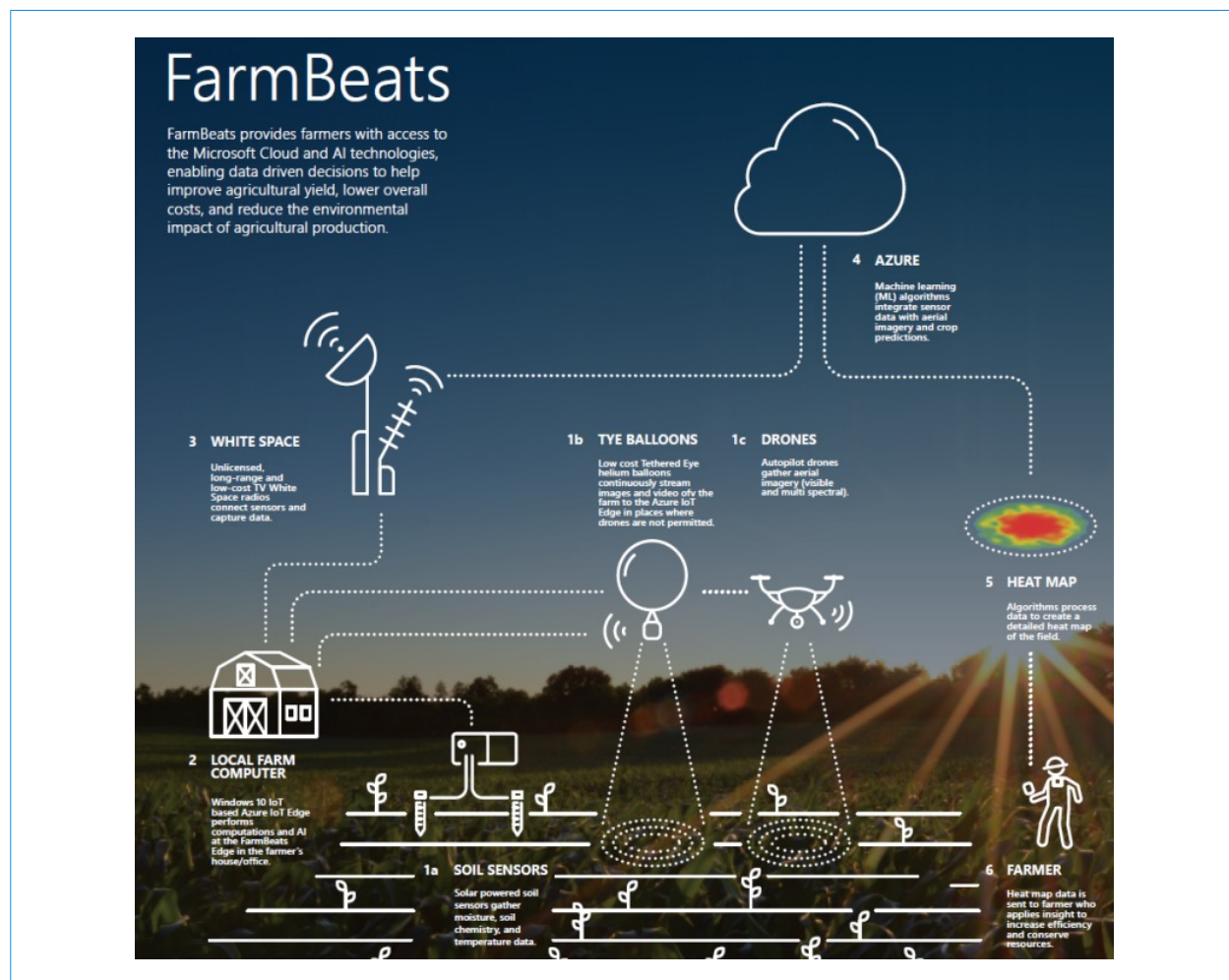
- Big data analytics in agriculture with its application in precise farming methods and other information for decision support systems.
- Supply chain management on the go: From sourcing quality agricultural inputs, hiring seasonal agricultural workers, product aggregation, transportation, and warehousing to contractual agreements with large-scale distributors, digital platforms are being used to formalize these traditional transactions, bringing efficiencies and productivity.
- Crop insurance is provided via short message service (SMS) in India, Kenya, and the Philippines.
- Smart irrigation systems: These would use the Internet of things (IoT), a system of interrelated computing devices including remote sensors, that provide the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Small landholders' water pumps integrated into such a system can be metered real-time and shut off remotely if the farmer has gone beyond his/her water allocations.

**Figure 39:** Digital applications for agriculture



Source: Farms.com Precision Agriculture Conference 2015

Figure 40: Microsoft FarmBeats Infographic



Source: Microsoft Corporation

## F. Skills development

A major initiative, the Mashreq Skilling Up Initiative, has been recently launched by the World Bank, with the aim to create up to 500,000 new jobs in the Mashreq countries, by means of cutting-edge skills development programs. As digital skills will be one of the essential foundations for successful digital transformation, this is a core area of engagement for the Mashreq region.

## VII. Recommendations and potential World Bank engagement

### A. Strategic planning and reform needs

#### 1. Iraq:

##### **Short term**

- Remove the restrictions on the private operators to build, own, and operate domestic and international fiber infrastructure; this was pledged as a short-term action by the Iraqi government as part of the reform commitments during the Kuwait Conference in February 2018.
- Enact a telecommunications legislation that lays the groundwork for increasing competition and private sector participation and provides legal and regulatory certainty for local and international investors.
- Develop a government plan to use digital technology in the recovery and peacebuilding effort, particularly in larger cities such as Mosul, leveraging the digital applications to improve service delivery in areas under reconstruction, increase citizen participation in the reconstruction effort and in policymaking, and increase transparency of government funding and investment.
- Put in place the conditions to develop Iraq as a hub for international connectivity.
- Reinforce the regulatory authority capacity.

##### **Medium term**

- Develop and implement a public-private partnership (PPP) in the rebuilding of critical fiber infrastructure: backbone intercity infrastructure, backhaul, and access in main cities.
- Develop and enact regulatory tools, chief among them spectrum management and reallocation, regulation of dominant operators, infrastructure sharing, and a unified licensing regime.

#### 2. Lebanon:

##### **Short term**

- As a priority, the Government must develop in the short term a unified vision for the ICT sector and a clear consensus on policy, without which sustainable sector development cannot be realized. Sector policy should include:
  - Options to proceed toward sector reform, including the introduction of competition and private sector involvement in the sector and a clear strategy to address poor and underserved areas and disadvantaged households; this strategy should take into consideration the fiscal and political economy implications of the sector.
  - The identification of specific targets for broadband (high speed Internet) deployment for the overall population of Lebanon;

- An assessment of the fiscal and growth impact of different reform scenarios; and
- The development of an institutional reform plan, with clear roles and attributions for the different sector actors.
- The enactment of a harmonized license framework for digital service providers (DSPs) that should include:
  - No limits on the number of DSPs authorized to lay down fiber (all DSPs meeting certain conditions are authorized, as in the class license regime);
  - No minimum investment obligation: the successful examples of Eastern Europe show that small and micro operators can be a formidable force behind the development of broadband; it should be the market, and not the Government, to determine the number of players, through competition and consolidation;
  - A uniform revenue sharing agreement: different DSPs have different revenue sharing agreements with the Government (ranging from 20 to 40% of the revenues). A revenue sharing agreement with too high a percentage impacts the business plan of an operator and such an agreement will either limit investment or increase the final price for the customer, or a combination of both. More generally, a uniform revenue sharing agreement is needed for clarity and to help create a level playing field.
- Reform the fiscal transparency and management of the sector in order to enable a more accurate assessment of the fiscal impact of reforms in the short, medium, and long term.

#### ***Medium to long term***

- Introduce competition in the sector and increase private sector participation on an equal playing field among all players and according to the balance between fiscal implications and economic and sector development.
- Re-empower the sector regulator and modernize the legal and regulatory framework.

### **3. Jordan**

#### ***Short term***

- TRC should undertake a Regulatory Impact Analysis (RIA) to assess the positive and negative effects of proposed and existing regulations and non-regulatory alternatives and to ensure that regulation will be welfare-enhancing from the societal viewpoint, as far as the PPP is concerned. The twofold objective of the RIA would be to:
  - Provide a detailed and systematic appraisal of the potential impacts of the current regulatory regime on the PPP transaction; and
  - Assess to what extent the current regulatory tools would gain the confidence of investors and facilitate a successful achievement and completion of the PPP transaction.
- Establish a specialized telecommunications court which would allow expedited resolutions of ICT regulatory/competition-related issues to significantly reduce the average time for the resolution

of cases, improve the effectiveness of the regulatory regime, and avoid any dilatory tactics by private operators.

- Establish uniform regulatory obligations regarding rights of way (ROW). For operators it is important to be clear on the applicable laws and regulations, which entity has jurisdiction for granting public rights of way, and which entity is responsible for settling disputes. In Jordan, the lack of uniformity and transparency and the complexity of administrative procedures result in: (i) uncertainty, which can cause delays and slow down the pace of FTTH deployment; and (ii) delays in rolling out networks, which can be costly for operators and can delay the development of competitive markets. We recommend the following:
  - Define streamlined administrative procedures at the national level with respect to (among others) setting deadlines to receive public rights of way permits for investment with clear delay time; and
  - Develop a "one-stop shop" information website to provide relevant information to satisfy administrative requirements (information on application forms, fees) and facilitate electronic submission of requests at the various local levels.

#### ***Medium to long term***

- Enter into a broadband PPP with a wholesale operator to develop the national broadband network (NBN) and use it as a tool to extend access to broadband connectivity, provide a platform for cloud and data hosting, and leverage the knowledge process outsourcing (KPO) and information technology outsourcing (ITO) industry in Jordan.
- Develop a fifth generation mobile (5G) sandbox, allocate the spectrum, and launch 5G services in Jordan.
- Building on the broadband PPP linked to the NBN Internet regional connectivity, introduce data and cloud hosting services to the Mashreq region (Iraq and Syria).

#### **4. Regional Level Reforms**

At the **regional level**, the following implementation map is recommended:

- On the basis of this report, assess opportunities for regional integration of broadband networks by leveraging existing assets and networks, including terrestrial and submarine backbone networks and the cross-national fiber assets of the utilities.
- Convene a regional workshop with the aim of agreeing on a common action plan to strengthen regional connectivity in the Mashreq and positioning the region as a digital hub at three different levels: (i) internet connectivity; (ii) data hosting and cloud; and (iii) export of business process outsourcing (BPO)/ITO/KPO and digital services to the rest of the world.
- Leverage existing World Bank instruments and donor partners to design and implement an investment and advisory program on international broadband connectivity at the regional level.

## B. Investment in infrastructure

### ***Access networks: Investment needs exceeding US\$4 billion***

The development of physical access networks (“last mile” access) will be the area where most policy attention will need to be paid and the area that could attract the largest amount of investment. In this area, the countries of the region have different regulatory approaches when it comes to entry barriers:

- **Lebanon:** DSPs were recently authorized to use OGERO’s ducts to lay down fiber for their own use; further reform is needed to make sure that a fair level playing field is established, giving the same rights to all DSPs and MoT and introducing mechanisms to serve rural areas.
- **Jordan:** There is an open market for DSPs. The Government, with World Bank assistance, is studying next-generation reform to expand access through an NGN Broadband PPP.
- **Syria:** The assessment is complicated by the current hostilities, but only mobile operators and the incumbent can offer data services.
- **Iraq:** ITPC has a monopoly on fiber deployment and limited investment is taking place. The mobile operators and independent DSPs would be interested in entering this market segment.
- **Iran:** Several DSPs are authorized to offer data services.

In this area, the priorities for all countries in the region will be to: (i) eliminate entry barriers for DSPs to offer data services; (ii) focus private sector investment in densely populated areas and create the incentives to invest in second tier cities and rural areas; and (iii) implement necessary regulatory reform.

The level of investment needed to bring high speed broadband access to 30% of the population of the Mashreq through fiber access (about 13 million households) will be between **US\$4.0-5.2 billion**.

### ***National and regional backbone networks: Investment needs exceeding US\$500 million***

There is a considerable opportunity for the region to develop regional broadband connectivity. These networks would bring a strong market potential and positive socioeconomic impacts for the Middle East region. The Mashreq countries have a prime geographic location that enables them to become a hub for international connectivity. This geographic location has the potential to serve the Internet markets of the Gulf Cooperation Council (GCC) region and the international traffic between Europe and Asia. Transiting international traffic through Jordan and Iraq would generate higher Internet capacity for the region at competitive prices, create new business opportunities for domestic investors, and provide new jobs in infrastructure deployment.

There is considerable interest among domestic and foreign investors in Iraq as a regional hub for Internet traffic. Many sources have reported ongoing projects and negotiations with international partners to expand fiber infrastructure from the submarine cable landing points in Al-Faw to Turkey and Iran via the KRI. However, the rules and regulations for that infrastructure deployment are still obscure. So far, the Ministry of Transport and Communications has licensed four operators to provide international terrestrial connectivity through Iran and Turkey to local users. The regional broadband infrastructure connecting Jordan and Iraq could also be strengthened and provide redundancy routes and commercial alternatives to the existing terrestrial networks.



The development of international and backbone connectivity will be an essential priority. An analysis is complicated by the fact that major networks such as JADI and AMEER are currently disrupted. However, the following priorities could be listed if the circumstances allow:

- Reestablish Turkey-Syria connectivity;
- Use regional transport projects to foster backbone fiber connectivity, especially in the Lebanon-Syria corridor and in Iraq;
- Leverage the fiber assets of NEPCO to develop backbone connectivity in Jordan, possibly in conjunction with the broadband NBN (if technically feasible);
- Develop Aqaba in Jordan and Al-Faw in Iraq as gateways for international connectivity;
- Expand the number of submarine networks landing in Tripoli consistent with Lebanon's Capital Investment Program by adding new cables to Greece and Italy; and
- Consider the feasibility of pan-Mashreq networks, leveraging the infrastructures of Iran and Iraq and connecting with both the submarine and terrestrial infrastructure in the Arabian Peninsula and with the routes to South Asia and China.

The development of these networks will need to be accompanied by enabling regulation, including:

- Fair and open access to international connectivity, including access to the landing station; and
- Regulatory enhancements to allow easy access to roads, ducts, and other points with relevance for telecom operators.

***Data centers and IXPs: Investment needs exceeding US\$200 million***

The development of IXPs beyond the two operating in Lebanon and the four in Iran is also a major priority. The emergence of a regional IXP could also be an important project, and it has the support of the Regional Director of the Internet Society.

- We recommend the following:
- Develop 1 additional IXP in Lebanon;
- Develop 2 IXPs in Jordan;
- Develop 1 IXP in Syria;
- Develop 4 IXPs in Iraq; and
- Develop a Regional IXP.

In addition, it would also be important to consider the development of the data center industry in the Mashreq, modeled on the examples of London, Dubai, and other international hubs.

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