5G in MENA:
GCC operators set for global leadership

GSMA

Intelligence

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www.gsmaintelligence.com

info@gsmaintelligence.com

Authors
Pablo Iacopino, Director of Ecosystem Research
James Robinson, Senior Analyst
Mike Meloan, Lead Analyst

Contributors
Ammar Hamadien, Head of Strategic Engagement MENA
Andy Hudson, Head of Policy
Brett Tarnutzer, Head of Spectrum
Jawad Abbassi, Head of MENA
Mani Manimohan, Senior Director Public Policy
Michele Zarri, Technical Director
Mohamed Abbes, Public Policy Director
Peng Zhao, Director Spectrum Market Engagement
Peter Jarich, Head of GSMA Intelligence
Veena Rawat, Senior Spectrum Advisor
Vikram Raval, Senior Policy Director

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1 Executive summary

5G is rapidly moving from trials to early commercialisation. Between 2018 and 2020, more than 50 countries will launch 5G mobile services across North America, Europe, the Middle East and Asia Pacific. In some markets, the launch of 5G commercial services is occurring earlier than initially announced – notable examples include the US, China, South Korea, Australia and some of the Gulf Cooperation Council (GCC) Arab States.

This GSMA Intelligence report looks at 5G in the Middle East & North Africa (MENA) region across different perspectives: network deployment, spectrum, use cases, market opportunities, and policy and regulation. It also presents GSMA Intelligence forecasts for the number of 5G mobile connections in MENA, as well as comparisons with other regions and major countries.

The GSMA appreciates the important insights provided by operators from a number of countries in the MENA region: Batelco, Etisalat, MTN, Omantel, Ooredoo, Turkcell, Turk Telekom, Vodafone and Zain.

The report forms part of a series of publications on 5G from GSMA Intelligence to shine light on 5G developments around the world. It follows previous research on 5G in the US[1] and China.[2] 5G developments and early customer adoption in the US, China and the GCC Arab States will be closely watched by operators, vendors, internet companies, enterprises and governments around the globe, in order to learn lessons from 5G leaders.

GSMA Intelligence defines the MENA region as comprising 25 countries:

• Algeria	• Iran	• Lebanon	• Palestine	• Syria
• Bahrain	• Iraq	• Libya	• Qatar	• Tunisia
• Comoros	• Israel	• Mauritania	• Saudi Arabia	• Turkey
• Djibouti	• Jordan	• Morocco	• Somalia	• UAE
• Egypt	• Kuwait	• Oman	• Sudan	• Yemen.

[1] The 5G era in the US, GSMA Intelligence, 2018
[2] 5G in China: the enterprise story, GSMA Intelligence, 2018

The MENA mobile industry moves into early 5G deployments

While MENA is a diverse region in terms of mobile market maturity, mobile internet adoption and 5G timelines, major operators in the GCC Arab States are looking to be global leaders in 5G deployments, and are rapidly moving from trials to early commercialisation. Launch of 5G mobile services in the GCC Arab States will begin in 2019, when the first 5G smartphones will be commercially available. Further ahead, 15 MENA countries plan to launch 5G mobile services by 2025 – these account for more than half the markets in the region.

Although the number of 5G connections in 2025 will be around a quarter of those in Europe or North America, pioneer operators in MENA will contribute to the drive in global 5G developments and industry learnings from early 5G use cases and applications.

4G and 5G networks will coexist, remaining complementary for many years

Much of the 5G capex in pioneer markets across the region will likely come between 2020 and 2025 as 5G customer adoption grows and demand for enterprise use cases builds. Meanwhile, most operators will focus on LTE network deployments and growth in 4G customer adoption.

While 5G is built, 4G will continue to evolve, providing much needed coverage and capacity. As such, operators will be able to service a significant share of mobile data traffic on 4G networks, leaving 5G with the dual remit of absorbing increasing demand for capacity and underpinning consumer and enterprise services that require higher speeds and/or lower latencies, such as immersive reality, remote surgery and autonomous transport.

The non-standalone model will dominate early 5G network deployments

Most mobile operators in the region are planning non-standalone (NSA) network architecture. With this approach, operators are able to use existing macro sites and LTE spectrum as an anchor connection (including voice over LTE), with a densified network of small cells and use of mid-band (1-6 GHz range) and upper-band (above 6 GHz) spectrum to facilitate high-speed data services.

Standalone (SA) networks – which involve the use of a 5G core and new radio – will be introduced by some MENA operators in key locations of 5G demand, to leverage the full capability of low-latency features. There will be variation among MENA operators as to *when* – and in some cases *if* – the SA model will be deployed, and in which areas. For some operators in the region, a NSA or hybrid configuration could be a long-term solution.

Advances in immersive digital entertainment are key to drive incremental operator revenue in the consumer market

Enhanced mobile broadband will be the key use case in early 5G deployments in the region, while applications and services for enterprises are tested and then introduced. From a commercial point of view, the opportunity for operators to enhance the consumer experience through 5G networks, and hence drive incremental revenue, largely depends on linking 5G commercial propositions to developments in applications and content for immersive reality, eSports and enhanced in-venue digital entertainment (stadia, music venues). Some MENA operators, including du, Etisalat, Ooredoo, STC, Turkcell and Zain, are already showcasing potential applications of immersive reality.

Interest in 5G-based fixed wireless rises across the region

As in the US, 5G-based fixed wireless will be an early use case for 5G around the GCC Arab States, with several operators, including Etisalat, Ooredoo, STC and Zain, launching services between 2018 and 2020. Countries in other parts of MENA, including Turkey, will witness the commercialisation of 5G-based fixed wireless, though at least a couple of years behind the region's pioneer markets. While fixed wireless is not new in some of the MENA markets, 5G could drive momentum as a fixed broadband access solution in rural areas and in those countries with limited penetration of fibre-to-the-home (FTTH).

Operators must nurture 5G use cases for enterprises

In the enterprise space, there is broad agreement among MENA operators on the key industries where 5G can deliver the greatest long-term value. These include entertainment, logistics, automotive, smart cities and energy & utilities. Governments and operators, including du, Etisalat, Omantel, Ooredoo, STC, Turkcell, Turk Telekom, Vodafone and Zain, are collaborating on smart city initiatives to address population-related challenges and deliver socioeconomic benefits. Oil and gas, mining and possibly tourism – each particularly relevant to the region's economy – could also benefit from 5G networks, creating new opportunities for operators to work with companies in such industries.

Operators' success in the enterprise market will depend on a number of external factors, such as the mutual understanding of enterprise needs and 5G capabilities, and the pace and degree of digital transformation in certain industries. Operators will also face strong competition in the enterprise space from incumbent cloud-computing companies, including Amazon and Microsoft, who are targeting similar opportunities to support the digitisation of companies, with several advantages such as global scale and lighter regulatory rules.

5G adoption will reach 16% in the GCC Arab States by 2025

According to GSMA Intelligence, the number of 5G mobile connections in the MENA region will grow slowly in the first two or three years and will start gaining momentum in 2023. By 2025, there will be around 50 million 5G connections, with around 20 million in the GCC Arab States. The GCC Arab States will be slightly ahead of the global average by 2025, with 16% adoption (5G as a percentage of total mobile connections), compared to 15% globally.

Regulatory frameworks should evolve to help fulfil the potential of 5G

Operators in MENA largely agree that the mobile industry needs to work in partnership with government departments and other private sector players to help fulfil the potential of 5G for all stakeholders, and meet the demands of an increasingly digitised world. This applies to all countries in the region, including the less digitally advanced countries where governments and regulators should view 5G as an enabler of wider economic growth, societal progress and industry transformation.

However, policy decisions in key areas could affect the extent to which MENA's 5G ambitions are realised:

• **Spectrum –** Regulators across the region should complete the assessment of 5G spectrum requirements for their markets and commit to releasing sufficient quantities of mobile spectrum to operators in a timely manner. 5G needs a significant amount of new harmonised spectrum, supported by the device ecosystem. This applies to all frequency ranges (sub-1 GHz, 1-6 GHz and above 6 GHz) including the mmWave frequencies. The availability of spectrum in the appropriate bands is key to meet both coverage and capacity needs. The correct approach to licence renewal is also important; it enables operators to make rational, long-term investment decisions, while licence fees should be charged on an administrative pricing basis rather than being set to maximise government revenue.

• **Infrastructure –** With 5G networks expected to require more base stations than their predecessors, negotiating access to a site or a right of way should be made simpler and quicker, and should not leave operators with disproportionately high lease prices. Telecoms frameworks in the region should also allow for the prospect of active and passive infrastructure sharing, driven by commercial bilateral arrangements, which could drive efficiencies and reduce 5G deployment costs.

• **Tax –** Policymakers should consider reforms to their prevailing tax regimes and, in particular, sector-specific taxes, which have distortive effects and are in place in some MENA countries. Lowering or removing mobile-specific taxes will improve service affordability, boost adoption and digital inclusion, encourage infrastructure investment, and increase government revenues in the medium to long term.

2 Regional market context in the early 5G era

2.1 Three major trends are shaping the mobile market in the MENA region

While the Gulf Cooperation Council (GCC) Arab States[3] are moving from 5G trials to early commercialisation, MENA as a whole continues its transformation from a 2G-centric region to one making greater use of higher-speed, mobile broadband services. Three major trends are currently shaping the mobile market in the region.

- **3G takes the lead in 2018** – In mid-2018, 3G became the region's dominant mobile network technology by number of connections. By the end of the year, 40% of mobile connections in MENA will run on 3G networks, compared to 34% and 26% on 2G and 4G networks, respectively. Migration to smartphones is a major driver of the transition from 2G to 3G networks; smartphones in MENA account for around 55% of total mobile connections (year-end 2018). This will reach nearly 75% by the end of 2025.
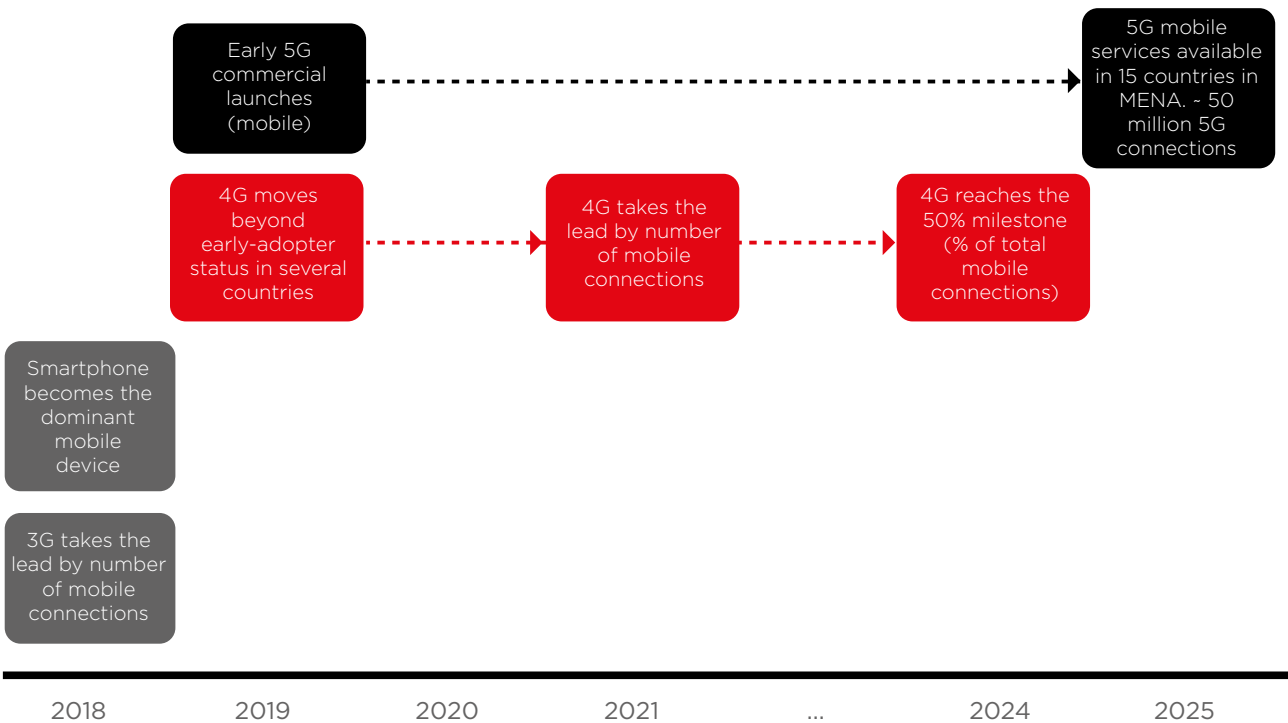
[3]Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE

- **4G is moving beyond early-adopter status in several countries –** By the end of 2018, nine of the 25 markets in MENA will have 4G adoption[4] of at least 30%, with Turkey leading the way at 75%. Over the coming years, 4G will reach two major milestones in the region: it will overtake 3G by number of mobile connections during 2021 and will account for half of total connections by 2024. 4G will also account for the largest portion of operators' revenue for the next decade, at least.

- **5G is moving from trials to early commercialisation –** A number of operators in MENA have announced plans to begin commercialisation of 5G mobile services in 2019, when the first 5G smartphones will be available. Between 2019 and 2025, 15 markets plan to launch 5G mobile services in the region. While the number of 5G connections in 2025 will be around a quarter of that for Europe or North America, pioneer operators in the region will contribute to the drive in global 5G developments and industry learnings from early 5G use cases and applications.

Figure 1

Major milestones in the MENA mobile market

Source: GSMA Intelligence

The figures presented above mask significant variations at the country level in terms of mobile market maturity, mobile broadband adoption and 5G timelines. While the more advanced countries are focused on 4G connections growth and early 5G developments, the less developed nations continue to face the challenge of how to grow subscriber penetration. By year-end 2018, in the GCC Arab States 77% of the population will be mobile subscribers and 67% will be mobile internet users. North Africa[5] will have an average subscriber penetration of 70%, while across the Other Arab States[6] penetration will stand at 48%, including three markets where less than a third of the population subscribe to mobile services (Comoros, Djibouti and Somalia).

[4]4G as a percentage of total mobile connections excluding licensed cellular IoT. The nine countries are Bahrain, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Turkey and UAE.
[5]Algeria, Egypt, Libya, Mauritania, Morocco and Tunisia
[6]Comoros, Djibouti, Iraq, Jordan, Lebanon, Palestine, Somalia, Sudan, Syria and Yemen

Figure 2

Subscriber penetration by country,[7] June 2018

UAE 84% · Qatar 83% · Bahrain 80% · Israel 78% · Kuwait 78% · Tunisia 75% · Saudi Arabia 75% · Algeria 75% · Libya 73% · Morocco 72% · Iran 71% · Oman 69% · Egypt 67% · Lebanon 66% · Turkey 65% · Jordan 61% · Syria 55% · Mauritania 52% · Iraq 52% · Sudan 46% · Palestine 45% · Yemen 43% · Somalia 31% · Comoros 30% · Djibouti 28%

GCC Arab States ■ **North Africa** ■ **Other Arab States** ■ **Others**

Source: GSMA Intelligence

2.2 How 5G fits into the evolution of the wider technology and digital ecosystems

Mobile has emerged as the platform of choice for creating, distributing and consuming digital solutions and services in MENA, and the region is increasingly demonstrating its technological innovation and leadership across various areas. As fixed broadband infrastructure in many MENA markets is lacking or mostly confined to large cities and business districts, the digitisation of industries, enterprises and societies will largely rely on existing 4G networks and early 5G deployments. With mobile a platform for the development of new technologies and services, governments and businesses are eager to harness 5G's potential, applying it to a range of different sectors to strengthen local and national economies.

Most operators in the region expect 5G to offer enhanced mobile broadband initially, while use cases and applications for enterprises are tested and then introduced. Immersive reality,[8] eSports and enhanced in-venue digital entertainment (stadia, music venues) are key focus areas in the 5G era, while the longer term vision could involve holographic video. Over time, 5G will serve as an enabler to use cases for massive Internet of Things (IoT) and ultra-reliable, low-latency communications. Beyond pure mobile, fixed wireless is an additional 5G-based use case (an initial use case in some countries in fact) with several MENA operators expected to launch services between 2018 and 2020.

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[7]Subscriber penetration is calculated as the number of unique mobile users divided by the population. Unique users are those who have subscribed to mobile services at the end of the period, excluding licensed cellular IoT. Subscribers differ from connections such that a unique user can have multiple connections.
[8]Immersive reality is widely used to describe technologies that provide a more enriched and immersive experience. It includes augmented reality (AR), augmented virtuality (AV) and virtual reality (VR).

Figure 3

5G use cases

Enhanced mobile broadband
• Gigabytes in a second
• Immersive reality
• eSports
• Live in-venue digital entertainment
• Work and play in the cloud

5G-based fixed wireless
• Last-mile technology for fixed broadband access

Massive Internet of Things
• Smart homes
• Smart cities
• Smart buildings
• Multiple vertical industries
• Wearables

Ultra-reliable, low-latency communications
• Autonomous driving
• Industrial and vehicular automation
• Robotics
• Remote surgery
• Mission-critical applications

Note: not exhaustive

Source: GSMA Intelligence, ITU, 3GPP and major vendors

To some degree, 5G is different from previous mobile network technologies because of its unprecedented connection with other emerging technologies such as immersive reality, artificial intelligence (AI) and autonomous driving, and use cases, including IoT. As such, a number of MENA operators are investing directly in the start-up community or forming commercial strategic partnerships with innovative tech companies. The Dubai Silicon Oasis is an example of how the region is demonstrating leadership in this space, providing a high-tech, free-trade zone for firms of all sizes in the IT, telecoms and software sectors, among others. As the MENA region moves into the 5G era, such collaboration will be important to facilitate initial learning and developments across several 5G use cases.

Turkey has the 5G Valley Open testbed which involves the Information and Communication Technologies Authority, major universities and all mobile operators in the country. Academics, researchers and start-ups can utilise the 5G Valley Open testbed for R&D tests for 5G and beyond technologies.

• **Immersive reality–** According to the GSMA Intelligence Consumer Survey, mobile users in the GCC Arab States are highly engaged in the digital world. Their engagement is as high as that of mobile users in North America and the more tech-advanced countries across Europe and Asia Pacific.[9] The majority of smartphone users in these GCC Arab States – especially millennials – use their phones frequently to access not only internet-based messaging and social media but also entertainment content, e-commerce and a range of digitally delivered services. Some of these subscribers are already immersive reality users or will become so in the 5G era. As video consumption on mobile devices continues to grow, video technology further evolves and newer AR and VR applications make content even more immersive and data intensive, 5G networks will be key to supplement existing 4G networks and supply the mobile data traffic capacity required.

[9]See Section 4.1 for more details.

• **Internet of Things –** While the IoT market in MENA is still in its infancy compared to the US and certain Asian countries, the arrival of 5G is likely to accelerate developments. GSMA Intelligence predicts that there will be 1.1 billion IoT connections (cellular and non-cellular) in MENA by 2025, a more than three-fold increase from year-end 2017.[10] Due to the diversity of IoT applications and services, different access technologies will address different requirements. While many cellular IoT services and applications will be delivered by NB-IoT or LTE-M (which form part of the wider 5G family for IoT), 5G will play a key role in supporting the next phase of enterprise digitisation and will drive greater adoption of IoT in different sectors, particularly industrial IoT applications, which will account for almost 60% of the 1.1 billion IoT connections in the region by 2025.

• **Transformative technologies –** Across the MENA region, mobile operators, ecosystem players and governments are either looking to or have pledged to invest in technologies such as AI and blockchain to drive forward digital evolution. The region's ambitious and rapid transformation is therefore propelling it into the global spotlight as a go-to place to experience the implementation of technology's latest trends and innovations. Spending on blockchain solutions is likely to ramp up over the coming years, with a number of organisations in MENA already making bold commitments. In March 2017, the Smart Dubai Office announced plans to implement the technology into services across the city, aiming to make it the first blockchain-powered government in the world by 2020. The UAE is seeking to champion the adoption of AI in healthcare, water and education – among others – underpinned by 5G mobile connectivity. Meanwhile, Emirates Integrated Telecommunications Company (EITC) has opened an 'Idea Hub' to research and showcase digital technologies and applications in smart cities, data science, IoT, AI and blockchain.

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[10]IoT: the next wave of connectivity and services. GSMA Intelligence. 2018

3 5G deployment

3.1 MENA operators are moving from 5G trials to early commercialisation

The MENA region continues to make progress with 5G trials ahead of early commercialisation from 2019.[11] While initial 5G launches will occur mostly in the GCC Arab States, 15 countries across the region plan to launch 5G mobile services between 2019 and 2025.

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[11] Early commercialisation of 5G mobile services. 5G-based fixed wireless services may have different timelines. See Section 4.3 for more details on 5G-based fixed wireless in the MENA region.

Figure 4

Commercial launch of 5G mobile services in MENA

2019	2020	2021	2022	2023	2024	2025
Bahrain	Oman	Jordan	Morocco	Algeria	Iran	
Kuwait		Turkey		Israel	Sudan	
Qatar				Lebanon		
Saudi Arabia				Tunisia		
UAE						

Note: excludes 5G-based fixed wireless

Source: operator announcements or GSMA Intelligence forecasts based on previous technology migration

Progress with 5G in the region is being driven by the mobile industry and by governments. Several MENA operators have announced details of their 5G plans and are undertaking a number of projects and initiatives. These include collaboration on the development of industry standards (3GPP's work) and agreements with major vendors such as Ericsson, Huawei, Nokia and Samsung to drive 5G developments, find the most appropriate network deployment model and identify viable use cases. These agreements also include memoranda of understanding (MoUs) to jointly develop and test selected 5G and IoT use cases.

Mobile operators in the GCC Arab States seek to be global leaders in 5G deployments, and are pushing ahead with trials and early commercial launches.

Between May and June 2018, Etisalat, Ooredoo, STC and Zain all stated they had launched 5G in their respective home markets of UAE, Qatar, Saudi Arabia and Kuwait. While fixed wireless is an initial use case in 2018, the first 5G mobile services will be commercialised in 2019, when the first 5G smartphones will be available.

Meanwhile, GCC operators will continue to build the 5G infrastructure required for early 5G commercial services. For example, Ooredoo has already installed over 85 5G network towers (of a planned 100) around some of Doha's busiest, most populated areas, ensuring both consumers and businesses will have instant access to 5G as soon as the service becomes commercially available.

3.2 5G spectrum availability remains a key issue around the region

Although an increasing number of operators are testing 5G services across the region, 5G spectrum availability remains an issue. According to MENA operators, the amount of spectrum allocated for 5G trials is not enough in some countries to allow wider scale trials or fully exploit early 5G developments. Given that the MENA region is diverse in terms of population, urbanisation and mobile developments, the minimum or ideal bandwidth required varies by country. For the 3.5 GHz frequency range, a key range for early 5G deployments, some operators believe that the ideal bandwidth could ultimately be higher than 100 MHz of contiguous spectrum per operator in certain countries or locations; it will largely depend on 5G progress across various aspects including customer adoption, coverage, use cases and quality of service.

Furthermore, the mix of spectrum frequencies (sub-1 GHz, 1-6 GHz and above 6 GHz) currently available to MENA operators, or foreseeable in the near term, is unbalanced, limiting more appropriate use of spectrum for specific applications in certain areas.[12] Most 5G trials in the MENA region are using, or are expected to

use, frequency bands in the 1-6 GHz range. Within this, the 3.5 GHz range is the most used. Fewer operators plan to use sub-1 GHz frequencies as a coverage band in early 5G deployments, while most are keen to use mmWave frequencies when they become available. To that end, some operators plan to develop mmWave as a small cell layer in hotspot areas by 2019/2020 to help demonstrate use cases requiring ultra-high throughput and low latency.
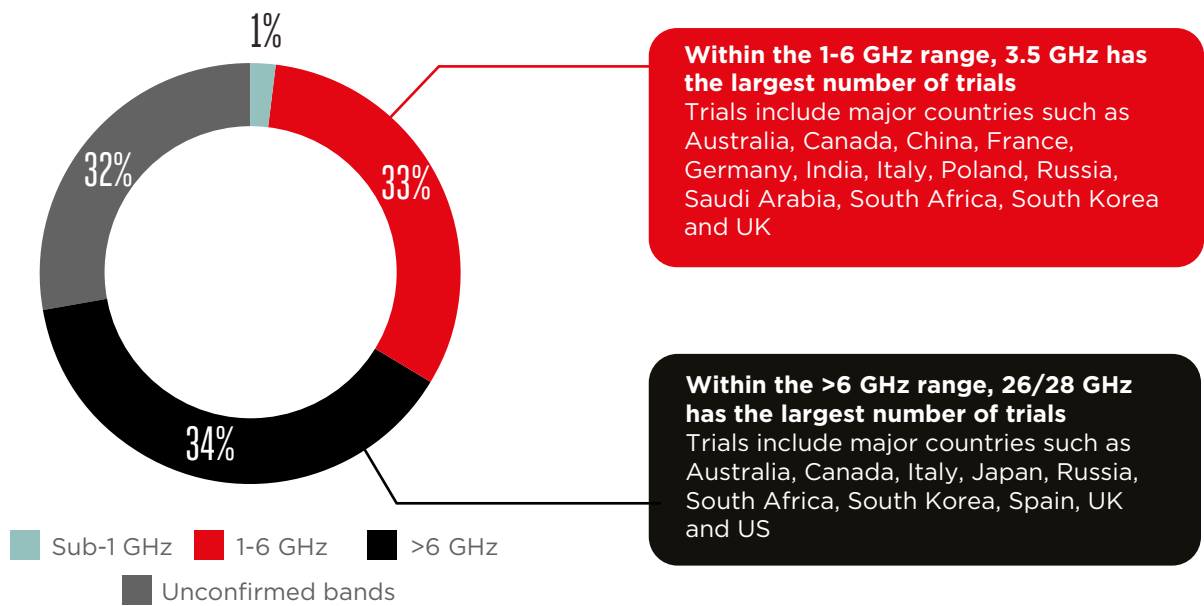
Governments across the GCC Arab States have launched public consultations to address the need for 5G spectrum allocations in various bands within the 1-6 GHz frequency range. In Bahrain, the Telecommunications Regulatory Authority (TRA) has also issued a consultation for new spectrum to be awarded in the 800 MHz frequency bands. Within the MENA region, regulators are also exploring the possibility of using spectrum in the 2.6 GHz range as additional band for the deployment of 5G where there is a challenge in granting sufficient spectrum in the 3.5 GHz frequency range.

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[12] See Section 6.1 for more details on key spectrum challenges and future spectrum outlook in the MENA region.

While most 5G trials in the MENA region are using frequency bands in the 1-6 GHz range, globally a large number of 5G trials are being conducted using a balanced mix of 1-6 GHz and above 6 GHz frequency ranges. In total, more than 130 operators have trialled, or are trialling, 5G technology across nearly 70 countries. 3.5 GHz and 26/28 GHz have attracted the most attention so far around the globe.

Figure 5

5G trials around the world by range of spectrum band

Within the 1-6 GHz range, 3.5 GHz has the largest number of trials
Trials include major countries such as Australia, Canada, China, France, Germany, India, Italy, Poland, Russia, Saudi Arabia, South Africa, South Korea and UK

Within the >6 GHz range, 26/28 GHz has the largest number of trials
Trials include major countries such as Australia, Canada, Italy, Japan, Russia, South Africa, South Korea, Spain, UK and US

Sub-1 GHz   1-6 GHz   >6 GHz
Unconfirmed bands

Note: percentages of total number of trials worldwide. Trials completed or active (as of September 2018).
Source: GSMA Intelligence

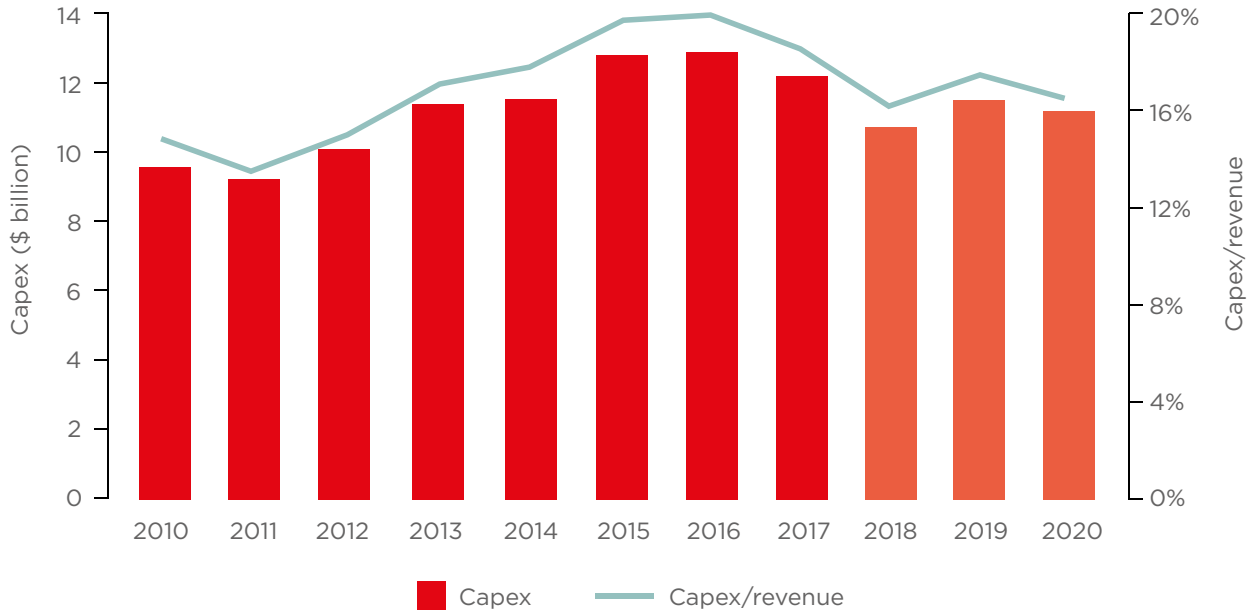# 3.3 Much of the 5G capex in pioneer markets will likely come between 2020 and 2025

Operators throughout the MENA region have already invested nearly $90 billion so far this decade in mobile capex (17% of mobile revenue on average per year) and will invest a further $34 billion between 2018 and 2020. However, much of the 5G capex in pioneer markets will likely come between 2020 and 2025 as consumer demand for 5G connectivity and services grows and enterprise use cases develop.

Meanwhile, most operators around the region will focus on LTE connections growth and network deployments. With 4G networks already providing near-ubiquitous population coverage in half of the MENA markets[13], operators will be able to service a significant share of data traffic on 4G networks, leaving 5G with the dual remit of absorbing increasing demand and underpinning consumer and enterprise services requiring higher speeds and/or lower latencies such as immersive reality, remote surgery and autonomous transport.

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[13] In the MENA region as a whole, 4G population coverage has more than tripled since 2015, reaching 53% of the population in June 2018. By the end of 2020, it will reach two thirds of the region's population.

Figure 6

Mobile capex in the MENA region

Source: GSMA Intelligence

From a network deployment perspective, most mobile operators across the region are planning non-standalone (NSA) network architecture. With this approach, operators are able to use existing macro sites and LTE spectrum as an anchor connection (including voice over LTE), with a densified network of small cells and use of mid-band (1-6 GHz range) and upper-band (above 6 GHz) spectrum to facilitate high-speed data services. With an urbanisation rate of 65%[14] and ongoing investments in LTE (both population coverage and network capabilities), such an approach makes economic sense for many operators in the region.

Standalone (SA) networks – which involve the use of a 5G core and new radio – will be introduced by some MENA operators in key areas of 5G demand, to leverage the full capability of low-latency features. There will be variation among MENA operators as to *when* – and in some cases *if* – the SA model will be deployed, and in which areas. For some, a NSA or hybrid configuration could be a long-term solution.

5G will also add pressure to phase out previous generation networks, particularly in markets where 5G network rollout and customer adoption progress quickly. The timeline for such phasing out and the network most likely to be phased out (2G or 3G) are uncertain at this stage. This will vary by country depending on various spectrum factors (the amount and type of spectrum available to operators, and the

opportunities to re-farm existing spectrum for 5G use) as well as the number of devices used on 2G/3G networks. The speed of migration of voice services to VoLTE and, eventually, 5G new radio is also a key factor. In some MENA markets, 3G will likely be phased out earlier than 2G.

Finally, most MENA mobile operators believe that a co-investment network model involving financing from companies expected to increasingly benefit from 5G (those from across the wider digital ecosystem, IoT companies, and large organisations in key industries) is a potential approach in certain locations. However, such arrangements should be considered on an individual basis, looking at the business case, and involve commercially agreed terms.

[14] Source: World Bank, World Development Indicators, 2017
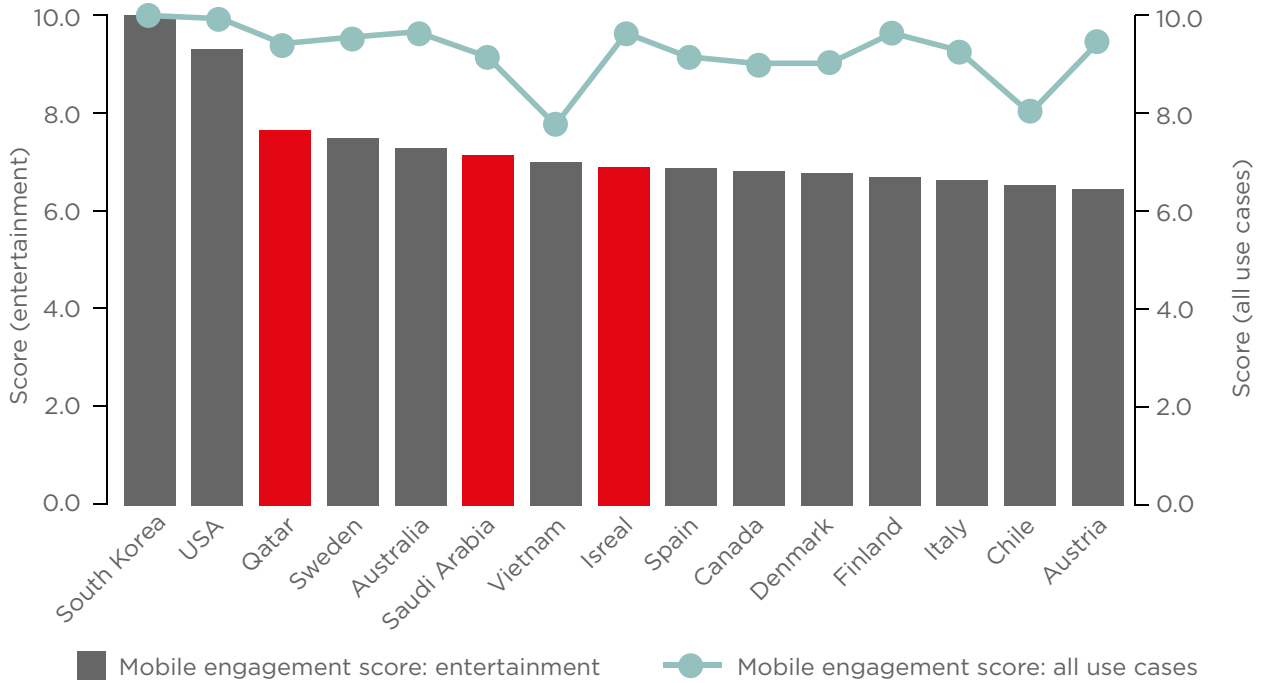
4 5G use cases and market opportunities

4.1 Consumer: advances in immersive digital entertainment key to drive incremental revenue

According to the GSMA Intelligence Consumer Survey, mobile users in some of the GCC Arab States are highly engaged in the digital world and use their smartphones frequently to access and consume a range of digital services and content. Looking at 18-44 year-old smartphone users around the world, Qatar, Saudi Arabia and Israel rank within the 15 most engaged countries for mobile entertainment and overall mobile engagement.[15] Some of these digital consumers are tech-savvy and typically early adopters of new technologies. As such, they are the addressable market for early 5G services in the MENA region.

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[15] The GSMA Intelligence Consumer Survey covers six countries in the MENA region: Algeria, Egypt, Israel, Morocco, Qatar and Saudi Arabia. Worldwide, it covers 50 countries (developed and developing) across all regions.

Figure 7

Mobile engagement among 18-44 year-old smartphone users

Note: top 15 markets worldwide by engagement
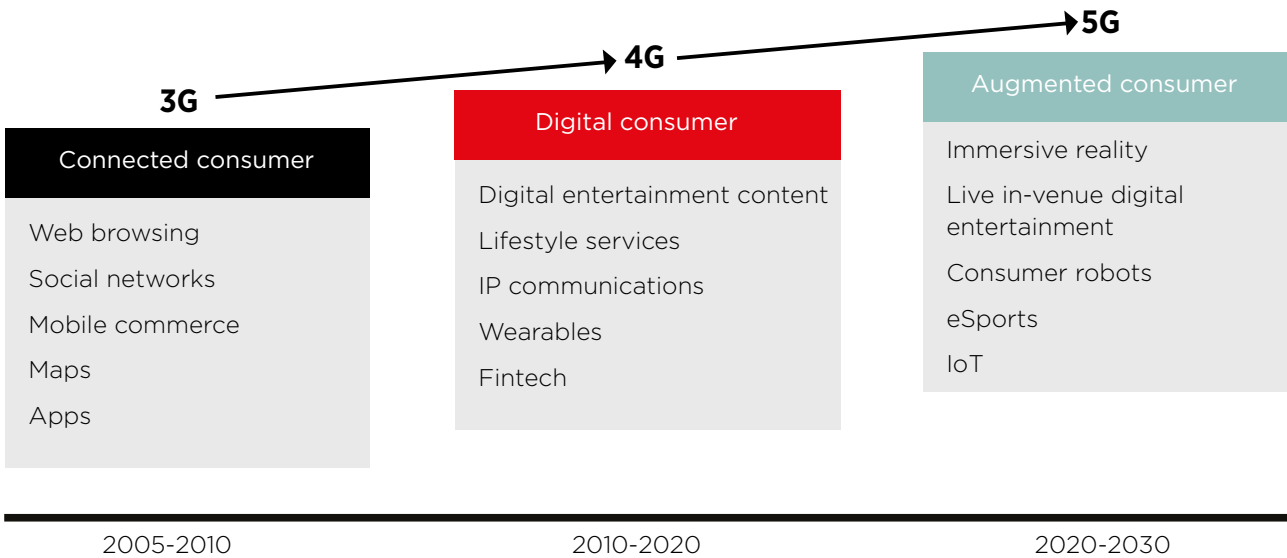Source: GSMA Intelligence Consumer Survey 2017

Methodology:

- Mobile engagement score (all use cases) – includes 26 mobile use cases across 10 categories: cellular communication, internet, social, navigation, IP communication, apps, digital commerce, entertainment, financial services and lifestyle.

- Mobile engagement score (entertainment) – includes five use cases across three categories: gaming, music and video.

- Scores range from 0 to 10, with 0 meaning no smartphone users engage at least once per month and 10 the top performing country.

While 4G has been driving the transition from connected to digital consumers[16] over the last 10 years, 5G is set to play a key role in the transition to the augmented consumer in the longer term. As illustrated in Figure 8, an augmented consumer is one who will adopt or consume a range of new technologies, including those expected to benefit from the faster speeds and/or lower latencies promised by 5G networks such as immersive reality, live in-venue digital entertainment and eSports.

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[16] Connected consumers are those connected to mobile internet. Digital consumers are those consuming digital services and content on a regular basis, with heavy data usage.

Figure 8

The evolution of mobile consumers

3G — **Connected consumer**

Web browsing

Social networks

Mobile commerce

Maps

Apps

4G — **Digital consumer**

Digital entertainment content

Lifestyle services

IP communications

Wearables

Fintech

5G — **Augmented consumer**

Immersive reality

Live in-venue digital entertainment

Consumer robots

eSports

IoT

2005-2010   2010-2020   2020-2030

Source: GSMA Intelligence

Some MENA operators are already showcasing potential applications for the augmented consumer. Notable examples include the following:

- **du –** In October 2018, du and Nokia successfully demonstrated 5G capabilities through a VR game at GITEX Technology Week 2018 in Dubai. Visitors at the event were able to experience the high speed and low latency of 5G through a football-related VR game.

- **Etisalat –** In December 2017, Etisalat demonstrated state-of-the-art 5G capabilities and services in the UAE using an advanced 5G based drone equipped with a 360-degree virtual reality (VR) camera with 4K streaming. The demonstration achieved up to 5 Gbps downlink and 2 Gbps uplink, with extremely low latency.

- **Ooredoo –** In May 2018, Ooredoo announced that its 5G NR network in the 3.5 GHz band was live in certain locations in Qatar, and that it had demonstrated 5G applications in Qatar at the Emir Cup final. The application included a platform to provide real-time video streaming, an AR venue engagement solution and immersive VR based on multi-access edge computing.

- **Turkcell –** The operator has a partnership with VR-Masters which provides both VR and AR content. In early 2018, Turkcell showcased the AR Field Force tablet application alongside the other VR-Masters applications at the Turkcell Tech Summit. The operator also demonstrated VR over 5G in several live trials, including at the 5G Valley in partnership with the Information and Communication Technologies Authority. Turkcell also plans to extend its digital operator vision to the 5G era, when existing digital services (messaging, music, TV) will be enriched by 5G capabilities.

- **Zain –** In October 2018, Zain announced it had performed a 5G demonstration in Lebanon achieving throughput speeds of approximately 1.5 Gbps. The operator demonstrated a cloud VR service and showcased 5G's ability to undertake 16 channels of high-quality 4K video playing simultaneously.

Industry-wide initiatives are also key to support developments in immersive reality. In October 2018, the 3GPP Codec and Media Working Group (SA4) completed work on the support of 360-degree VR streaming services, within Release 15 of the specifications. A set of VR video and audio operating points and their mapping to Dynamic and Adaptive HTTP Streaming (DASH) have been specified in 3GPP specification TS 26.118.

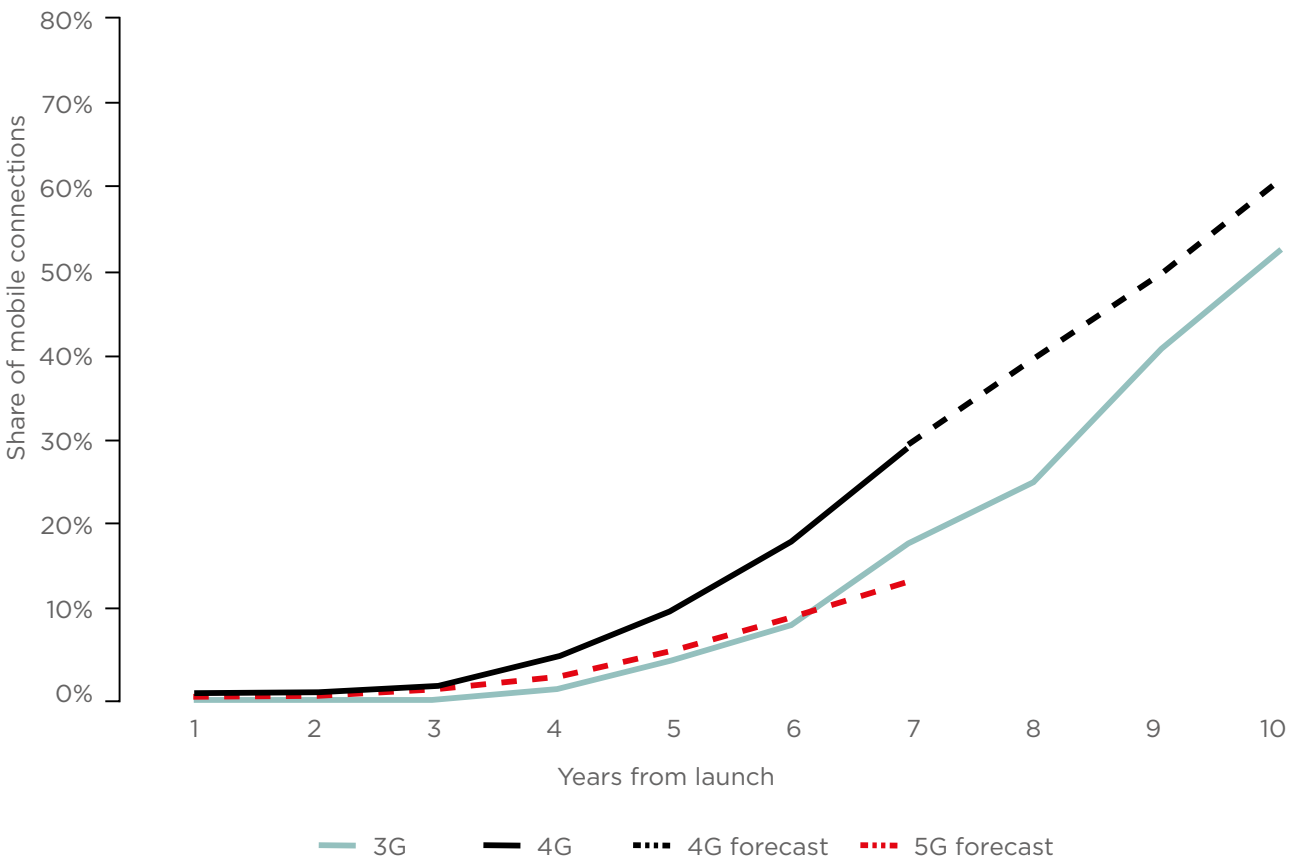## Key challenges to realising the 5G consumer opportunity

Opportunities for MENA operators to enhance customer experience and hence drive incremental revenue in the consumer market exist, but a number of challenges need to be addressed over the next five years, at the regional and global levels.

- **Advances in immersive digital entertainment are key to drive incremental revenue for operators –** From a commercial point of view, the opportunity for operators to enhance the consumer experience through 5G networks, and hence drive incremental revenue, largely depends on linking 5G commercial propositions to developments in applications and content for immersive reality, eSports and enhanced in-venue digital entertainment (stadia, music venues). To that extent, some MENA operators expect 5G's capabilities to drive greater consumer spend on mobile services in early years. However, in the longer term consumer spend will also reflect changing market dynamics as 5G network coverage grows and competition rises among operators.

- **The transition from digital to augmented consumer will take time –** Some of the key consumer use cases for the augmented consumer in the 5G era are still in the early development stage with mainstream adoption likely to be five or more years away. Immersive reality, for example, is still in its infancy, with limited capabilities, applications and content. Future developments will happen in stages. The initial phase will focus on device form factors and functions. Devices will be smaller and more capable; however, they will likely lack storage and compute/power capabilities, thus requiring partner devices such as smartphones or external batteries. In the second phase, faster connectivity will enable compute and storage to be cloud based, while battery technology will enable all-day use. Low-latency 5G networks and cloud-based resources (such as compute and storage) will be essential to spur developments in this second phase and beyond.

- **Smartphone availability in early 5G deployments will be limited –** MENA operators launching 5G mobile services in 2019 face the challenge of limited 5G device availability which, in turn, limits customer choice. A greater portfolio of 5G devices is expected to be available in MENA in 2020 as 5G customer adoption grows locally and in other regions, and new and cheaper devices are introduced. The first 5G smartphone models are likely to cost more than the most advanced 4G devices currently available, as they will offer enhanced features (potentially including advanced video capabilities such as 4K and 8K displays) and additional cameras and sensors to support AR and VR applications. These handsets will also need to support multiple spectrum bands as well as 4G and 5G in the same form factor. Over time, as the cost of 5G device components falls and the 5G device ecosystem scales, 5G devices will likely become more affordable, and hence drive wider customer adoption.

- **The role of smartphone subsidies to drive 5G customer adoption is uncertain –** Smartphone subsidy was an important driver of customer migration to 3G and 4G networks in some MENA countries and indeed many markets around the world. However, there are mixed views among MENA operators about the role of smartphone subsidies to drive 5G customer adoption. Some operators believe a subsidy would not be required if operators and device manufacturers collaborate to promote customer migration to 5G smartphones. Others expect some form of subsidy given that operators have always had a key role in driving device adoption and migration to new generation devices. Ultimately, commercial strategies will vary by operator and market, reflecting learnings from early 5G launches, consumer purchasing behaviours with regards to smartphone distribution channels, and competitive dynamics.

As with other technologies introduced in the region, 5G customer adoption is likely to start slowly and only grow more rapidly after several years of availability. However, there is significant variation in the region. As was the case with 4G, some of the GCC Arab States are looking to be early adopters of 5G and will see 5G adoption levels slightly above the global average.[17] Even in these markets however, customer migration to 5G networks is expected to proceed at a slower pace than that of 4G.

Figure 9

Migration to new mobile network technologies in the GCC Arab States

Note: excludes 5G-based fixed wireless
Source: GSMA Intelligence

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[17]See Sections 5.1 and 5.2 for more details on 5G customer adoption in MENA and in other regions.

While smartphones will be the principal 5G consumer mobile device in the region (and around the world) by number of 5G connections, other consumer mobile devices are expected to benefit from 5G capabilities. Among MENA operators, there is widespread agreement that data-only devices, wearables and immersive reality devices will help drive 5G customer adoption.

Figure 10

Take-up of 5G consumer mobile devices beyond smartphones

Question: To what degree will other/new consumer devices help drive 5G customer adoption in your country (or countries)?

Percentage of respondents

Device	High	Medium	Low
Data-only devices (i.e. cellular tablets, dongles, Mi-Fi routers)	60%	40%	
Wearables (i.e. smartwatches, fitness trackers)	40%	60%	
Immersive reality devices (i.e. AR, VR, AV)	40%	40%	20%

■ High   ■ Medium   ■ Low

Source: GSMA Intelligence 5G in MENA questionnaire

4.2 Enterprise market: revenue opportunities exist but ecosystem requires maturity

Most operator CEOs globally indicate that the main opportunity for incremental revenues in the 5G era will come from services and applications targeted at the enterprise sector.[18] In the MENA region, there is broad agreement among operators on the key industries where 5G can deliver the greatest long-term value.

These include entertainment, logistics, automotive, smart cities and energy & utilities. Oil & gas, mining and possibly tourism – each particularly relevant to the region's economy – could also benefit from 5G networks, creating new opportunities for operators to work with companies in these industries.
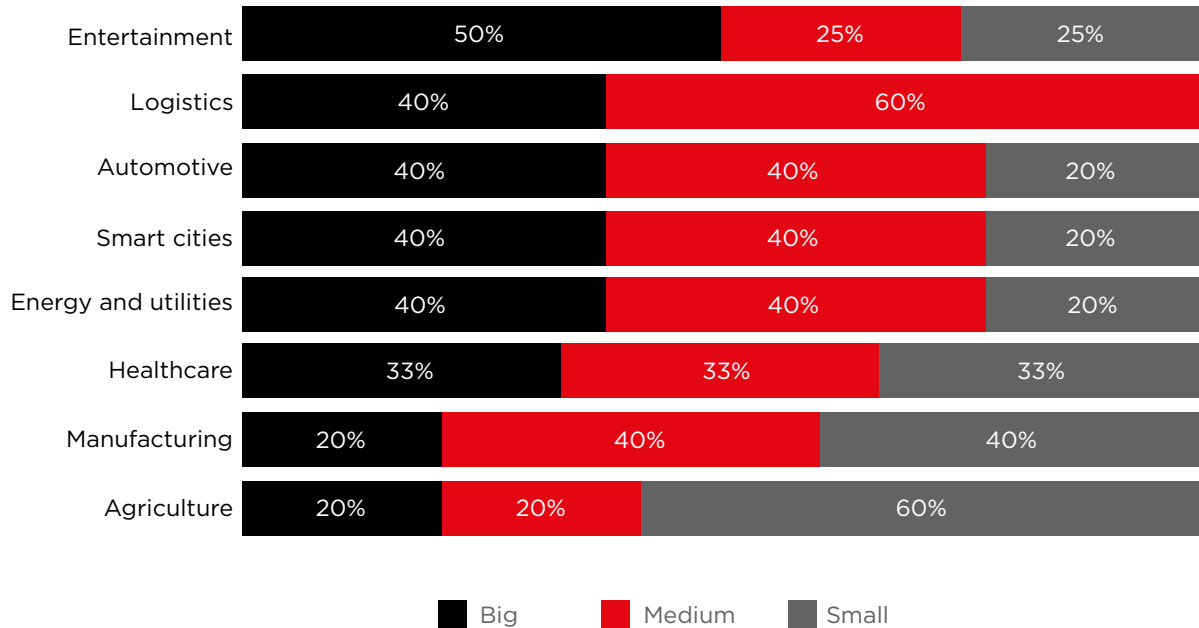
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[18]Source: GSMA CEO 5G Survey, October 2016. Question: Where will new operator revenues in 5G come from? Answer: nearly 70% of CEOs see enterprise as the most important opportunity for incremental revenue.

Figure 11

Long-term 5G revenue opportunities for MENA operators in the enterprise market

Question: Which industries or use cases do you anticipate as providing the largest 5G revenue opportunity for operators in your country (or countries) in the longer term (5-10 years)?

Percentage of respondents

	Big	Medium	Small
Entertainment	50%	25%	25%
Logistics	40%	60%	
Automotive	40%	40%	20%
Smart cities	40%	40%	20%
Energy and utilities	40%	40%	20%
Healthcare	33%	33%	33%
Manufacturing	20%	40%	40%
Agriculture	20%	20%	60%

■ Big   ■ Medium   ■ Small

Source: GSMA Intelligence 5G in MENA questionnaire

Major network infrastructure vendors also see opportunities for operators to leverage 5G network capabilities for enterprise applications. Ericsson, for example, estimates that telecoms operators in the UAE could realise incremental revenue of $3.3 billion (AED12.1 billion) by 2026 from the digitisation of industries through 5G, with manufacturing, energy & utilities and public safety showing the greatest growth potential.[19] To contextualise, this incremental revenue represents 6% of GSMA Intelligence's mobile revenue forecast in the UAE over the period 2019-2025.

For some MENA operators with large footprints across the region, the enterprise market is already forming a significant part of their total revenue (fixed and mobile) and could expand as the mobile industry moves into the 5G era. For example, in 2017, Ooredoo's group B2B revenue (businesses, SMEs and government clients) stood at QAR5.5 billion ($1.5 billion) – 17%

of annual group revenue.[20] In the UAE, Etisalat has established Etisalat Digital, a unit dedicated to driving digital transformation "by enabling enterprises and governments to become smarter".[21] According to Etisalat, the unit has become a major contributor to incremental revenue growth of its UAE operations and will be extended across the operator's wider footprint.

While LTE networks currently support early adoption of IoT solutions for enterprises (and will remain an important technology for some time to come), 5G network capabilities have the potential to drive future developments and larger scale adoption across industries. As more spectrum becomes available to mobile operators, 5G will be able to support mission-critical services by providing lower latencies as well as higher speeds, capacity and operational efficiency. The following analysis focusses on the development of the smart cities and automotive markets in MENA.

[19]The guide to capturing the 5G industry digitalization business potential, Ericsson, 2018
[20]Annual Report 2017, Ooredoo
[21]Annual Report 2017, Etisalat Group

Smart cities and urban developments

IoT momentum is particularly visible in smart cities. The Gulf region has one of the highest urbanisation rates in the world, home to cities such as Doha, Dubai and Riyadh where population growth and congestion are putting infrastructure under ever-increasing pressure. Governments recognise the contribution that well-designed smart cities can make in responding to these challenges, while delivering socioeconomic benefits to citizens. To improve the living standards of their citizens, particularly those in highly urbanised areas, governments are looking to implement smart city services to reduce pollution and traffic congestion, mitigate the consequences of climate change and manage economic resources more efficiently. Consequently, implementation of smart city technology is gaining momentum.

Figure 12

Examples of smart city initiatives in MENA

KUWAIT

- **Nationwide –** The government has launched a new long-term development plan - New Kuwait Vision 2035 - which aims to transform Kuwait into a world-class financial and commercial centre. This plan has seven pillars: efficient government administration, diversified & sustainable economy, quality infrastructure, sustainable living environment, high-quality healthcare, creative human capital and distinguished international status.

OMAN

- **Duqm –** Oman hosted the Smart Cities and Industry 4.0 Summit in April 2018, subsequently signing a memorandum of understanding with South Korea to develop Sultanate's first 'smart city' at the Special Economic Zone in Duqm.

QATAR

- **Lusail –** The new Qatari city of Lusail, located about 23 km north of the city centre of Doha, is being built from scratch as a high-tech, environmentally friendly smart city (at an estimated cost of $45 billion, or QAR164 billion).

SAUDI ARABIA

- **Five cities –** In 2017, the Ministry of Municipal and Rural Affairs launched the "application of smart city concepts" initiative as part of the country's National Transformation Program 2020 and Vision 2030. The scheme, run in partnership with the private sector, will target five Saudi cities by 2020, and will bring together various 'smart' components, including buildings, transport, street lighting and security, and emergency response systems.

- **Riyadh –** The King Abdullah Financial District in Riyadh is not only a pioneering financial hub; it also boasts energy-efficient glass skyscrapers and aims to offer a futuristic smart city experience, extending across mass transit, energy supply and more.

TURKEY

- **Various cities –** As part of Turkey's 2023 Goals, a number of smart projects are being, or will be, implemented across various cities. These smart city projects, which leverage network technologies, aim to generate cost savings and provide the infrastructure necessary to fuel future tech developments.

UAE

- **Dubai –** The Smart Dubai initiative, formally undertaken in 2014, aims to make Dubai the happiest city on Earth. Through collaborating with the private sector and multiple government partners, the Smart Dubai government office (SDO) facilitates Dubai's citywide smart transformation, to empower, deliver and promote an efficient, seamless, safe and impactful city experience for residents and visitors. In 2017, the SDO launched Dubai Now, a single platform for citizens, firms and visitors to access more than 50 smart services from the government and private sector.

- **Abu Dhabi –** The government of Abu Dhabi has begun the construction of its smart, sustainable Masdar City, designed to be a hub for clean tech companies. The city relies on solar energy and other renewable energy sources.

Mobile operators in MENA are engaged in smart city initiatives through partnerships with governments, city planners and wider industry players:

• **du –** du has been appointed by Smart Dubai to build the infrastructure required to deliver smart city initiatives. It also signed an agreement to transform Ajman's Rumaila District by installing and operating smart systems for street lighting, waste management and parking.

• **Etisalat –** Etisalat's Smartworld joint venture with Dubai South has partnered with EkinnoLab, a Polish software firm, to launch 'Park & X' services for transportation, parking, entertainment and hospitality.

• **Omantel –** Omantel has formed a strategic alliance with Huawei to develop smart solutions for security, lampposts, energy and utility management, and parking.

• **Ooredoo –** In 2018, Ooredoo and Cisco signed a MoU to collaborate on the provision of smart city, cloud and managed service solutions to enterprise customers in Qatar.

• **STC –** In 2018, STC and Cisco signed a MoU to collaborate on the development of 5G communication systems and networks for a range of industries and use cases including smart cities.

• **Turkcell and Vodafone –** The two operators have entered 5G development partnerships with major vendors to assess and test 5G network technology in Turkey across a number of use cases including smart cities. For example, Huawei and Vodafone are collaborating on the TechCity 2.0 Project in Istanbul, while Turkcell is collaborating with Huawei on the same initiative in Istanbul and Ankara.

• **Turk Telekom -** Turk Telekom and affiliated company, Innova, have a smart city management platform in which all smart applications operating in the city are managed by a single operations centre. Together, they have completed two smart city pilot projects with the municipalities of Karaman and Kars. They have also moved on to the second phase of the municipality of Antalya's smart city infrastructure project and have similar projects in the pipeline with the municipalities of Kirsehir and Mersin.

• **Zain –** Zain and Nokia are collaborating in Jeddah to drive developments for smart cities. The project will use IoT and cloud computing to connect devices, vehicles, homes and applications to improve public services, the business climate and residents' quality of life.

In the near future, Dubai and Qatar will be hosting two major global events: Expo 2020 and the 2022 FIFA World Cup, respectively. While both will feature headline-grabbing smart technologies to enhance the customer experience, they will also drive investment in 5G use cases across a host of industries as operators and ecosystem firms strive to be ready to show how 5G can serve the enterprise sector. Etisalat is installing base stations at Expo 2020 site to test and demonstrate 5G services. Also, in light of the millions of people who will attend the Hajj in 2019 and beyond, 5G is seen as a tool to ensure pilgrims' safety and security, and for better traffic management.

The drone market in MENA is also developing well outside of its military roots into civil applications. Potential use cases include goods delivery, remote site surveying, agricultural monitoring, remote mapping and disaster response. While existing UAV connectivity is generally serviced through point-to-point or satellite-based control, 4G and 5G are an additional solution, allowing non-line-of-sight signal transmission, best-in-class security through the on-board SIM, and the possibility to link connectivity with cloud-based platforms to run analytics, giving customers an end-to-end service model.

Automotive

Despite differences in opinion between mobile operators on the scale of the 5G revenue opportunity in automotive, many see autonomous, or simply connected, vehicles as a future 5G use case and are assessing the potential long-term implications that mainstream deployment could have for their strategies and business models. Orange and Vodafone, for instance, are members of the 5G Automotive Association (5GAA), a cross-industry global organisation that also includes telecoms equipment vendors and automobile manufacturers and suppliers.

In announcing timelines for its 5G network rollout, Zain outlined the potential of next-generation mobile services to support self-driving vehicles. Meanwhile, Dubai's Roads and Transport Authority (RTA) has announced a target for 25% of all journeys in the city to be autonomous by 2030, which is expected to deliver annual cost savings of AED22 billion ($6 billion). Ooredoo has tested a self-driving connected aerial taxi – a drone-like, two-person vehicle that runs on the operator's 5G network with the capability to take passengers on a 20-minute journey at speeds of up to 130 kilometres per hour.

Turk Telekom is carryng out tests in the intelligent transportation systems field using 5G technologies. At MWC 2018, Turk Telekom and Nokia showed a V2X demo, virtually taking participants to the busy roads of a metropolitan city, with intelligent transportation systems using 5G infrastructure in place.

Future automotive developments are increasingly linked to advances in mobile technologies, with widespread recognition that 5G's capabilities will further enhance some of the existing connected vehicle services (UHD high-precision mapping, real-time traffic monitoring, advanced driver-assistance systems) and unlock new use cases such as autonomous driving (remote driving and truly autonomous vehicles). While 4G networks have been enabling early developments in the Internet of Vehicles and supporting the first cellular vehicle-to-everything (C-V2X) pilots, 5G will

play a key role in future mobility by enhancing the C-V2X technologies needed to support larger-scale commercial deployments of truly autonomous vehicles for ride-hailing (levels 4 and 5 of car autonomy).[22]

As well as Ooredoo, a number of other mobile operators in MENA are engaged in trials of autonomous and unmanned vehicles. However, there are several hurdles to overcome before the more advanced MENA cities embrace increasing levels of car autonomy.[23] The first is legislative: developing suitable rules for larger scale level 4 and 5 pilots presents a specific set of challenges around liability for accidents, car hacking and data privacy. Public perception is an equally important matter. As the number of test miles multiplies, the volume of incidents caused by self-driving cars has also increased, which can negatively affect customer acceptance.

A third challenge is technology, as autonomous vehicles will have to process huge amounts of data in real time to inform driving decisions. A level 4 or 5 autonomous car will need to be self-sufficient, able to observe, analyse and travel in the selected environment. As such, the car will rely on on-board computers to process and make all driving decisions as current cloud-based solutions are too slow for real-time processing in critical situations. The role of 5G networks will be to connect the autonomous car to the wider ecosystem – including other vehicles (V2V), road infrastructure (V2I) and road users (V2P) – through C-V2X communications. This wide-area information is increasingly key and will be used to complement data captured by car sensors, cameras, radar and LIDAR.

5G will therefore not only connect people but will also support further enhancements in sophisticated inter-vehicle communication, safety and ultimately fully autonomous driving by delivering higher throughput, reliability and lower latency. Over the coming years, mobile operators will continue to pursue a cross-industry strategy, collaborating with governments and MENA's automotive sector, and positioning themselves to provide the network infrastructure for autonomous vehicles to become a reality.

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[22]The degree of car autonomy can be measured on a scale of 0 (no automation) to 5 (full automation – the car has no steering wheel, pedals or driver). Level 4 means that the car is in full control for the entire trip under certain conditions, with human backup driver.
[23]Global Mobile Radar, GSMA Intelligence, 2018

Key challenges to realising the 5G enterprise opportunity

While there is widespread recognition that enterprise provides revenue opportunities to MENA operators, several challenges need to be addressed over the next five years and beyond.

- **Digital transformation journey –** For industries and enterprises, 5G could be seen as part of a wider digital transformation journey, with implementation taking several years. Ideally, MENA operators would be able to apply a holistic approach across industries but there are challenges. Firstly, industries digitise at different speeds, with some (such as media and professional services) digitising faster than others (healthcare and construction). Also, companies digitise for different reasons, such as reacting to disruption, new revenue streams or opex efficiencies. Ultimately, the 5G opportunity for MENA operators (and around the globe) will be determined by the intersection between 5G network capabilities and enterprise needs.

- **Competition –** Enterprise is also a competitive market where telecoms operators compete with major cloud computing companies such as Amazon and Microsoft. Much of the 5G enterprise opportunity lies in providing customised network functionality through edge computing and network slicing to serve various industries. Amazon, Microsoft, Google and other incumbent cloud players are targeting the same opportunity, with several competitive advantages such as global scale, lighter regulatory rules and solid balance sheets to fund the rollout of edge computing infrastructure. They also already have commercial edge products on the market. It is difficult to predict the competitive dynamics in the longer term. Ultimately, the market may expand considerably, allowing many players to take significant revenue shares.

- **Alternative technologies –** 5G also competes with other technologies in a number of emerging use cases. As such, it is important for the mobile industry to show the technical advantages of 5G and how it can provide better results compared to alternative technologies, better economics through network scale, and best-in-class security through the on-board SIM. Nevertheless, successful monetisation of 5G requires greater maturity of the ecosystem, with new products and services available for enterprises. Innovation centres which bring together key players in the tech and industrial sectors are also key to test use cases (such as connected cars and autonomous vehicles), and help operators define investment plans.

4.3 5G-based fixed wireless: interest growing among operators in the region

5G-based fixed wireless – the use of 5G as a last-mile technology to provide fixed broadband connectivity – will be an early 5G use case in some of the GCC Arab States. A number of operators have announced plans to launch services between 2018 and 2020, following successful trials over the past couple of years.

Etisalat and Ooredoo are among the global leaders in 5G-based fixed wireless. In May 2018, Etisalat announced the launch of its first commercial 5G network. In doing so, the operator stated that, in the initial phase of the launch, 5G-based fixed wireless services and home devices would become commercially available in select parts of the UAE in September, with access increasing to other parts of the country depending on consumer demand and requirements.

At the same time, Ooredoo launched its 5G-based fixed wireless network in Qatar using 3.5 GHz spectrum, with testing indicating a peak speed of 2.51 Gbps with very high throughput and low latency. The operator is on track to hit its target of 100 5G network tower installations, and has already taken delivery of the first 5G home broadband devices.

Zain and VIVA have obtained 90 MHz of spectrum in the 3.5 GHz band for the provision of fixed wireless services, but require the Bahraini regulator's approval to launch.

Countries outside the GCC Arab States are also looking at fixed wireless as an initial use case, but at least a couple of years behind the region's pioneer markets. For example, during 2018, Turkcell launched Turkey's first live 5G fixed wireless network for trial, using spectrum in the 26 GHz frequency band.

For MENA operators, 5G-based fixed wireless offers a potentially lower cost of deployment, a faster time to market and a quicker return on investment compared to FTTH. FTTH solutions require operators to commit substantial capex to pass buildings, and even then take-up rates may be relatively low.

Due to the economic costs of deploying fibre-to-the-home (FTTH) to rural communities and the challenging terrain of certain geographies, 5G-based fixed wireless could represent a viable opportunity to deliver a high-speed, affordable (yet also profitable) broadband service, in areas that do not currently have readily available access to fixed line broadband.
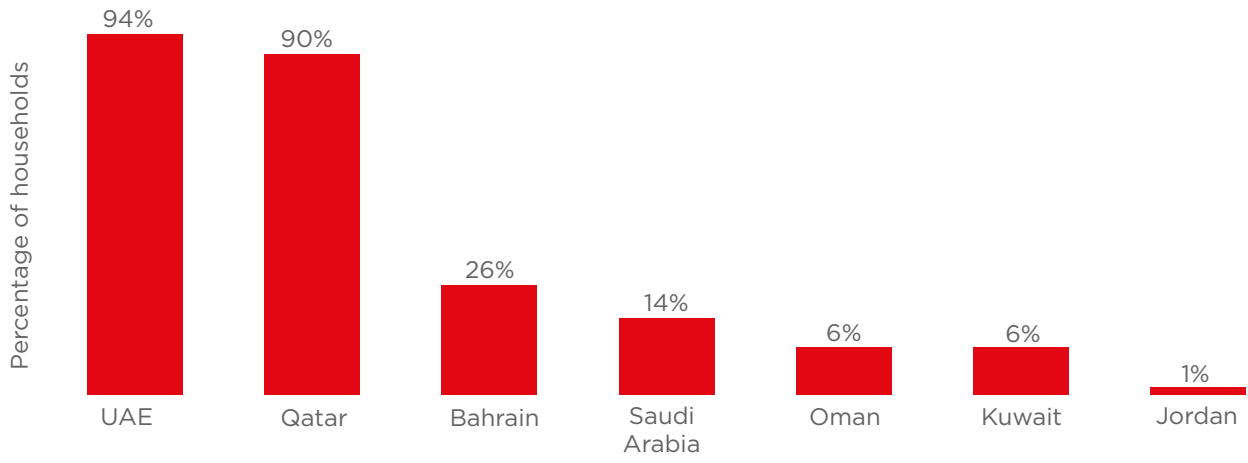
5G-based fixed wireless solutions also allow operators to expand their high-speed broadband offerings beyond their existing fixed line coverage, in some cases performing a stopgap role until fibre is rolled out. Alternatively it could act as a complementary technology to fibre broadband services in congested urban areas where the FTTH network is completely utilised.

As shown in Figure 13, a significant addressable market exists for 5G-based fixed wireless services in MENA, particularly in those countries with limited FTTH/B penetration. While operators have not provided specific estimates, they consider last-mile, 5G-based connectivity solutions as representing a promising incremental revenue opportunity.

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[24]Data correct as of September 2017. For more detail, see FTTH MENA Panorama 2017, FTTH Council MENA, 2018

Figure 13

Fibre broadband penetration in selected MENA markets (FTTB/H)[24]

Source: FTTH Council Europe

5 5G adoption forecast

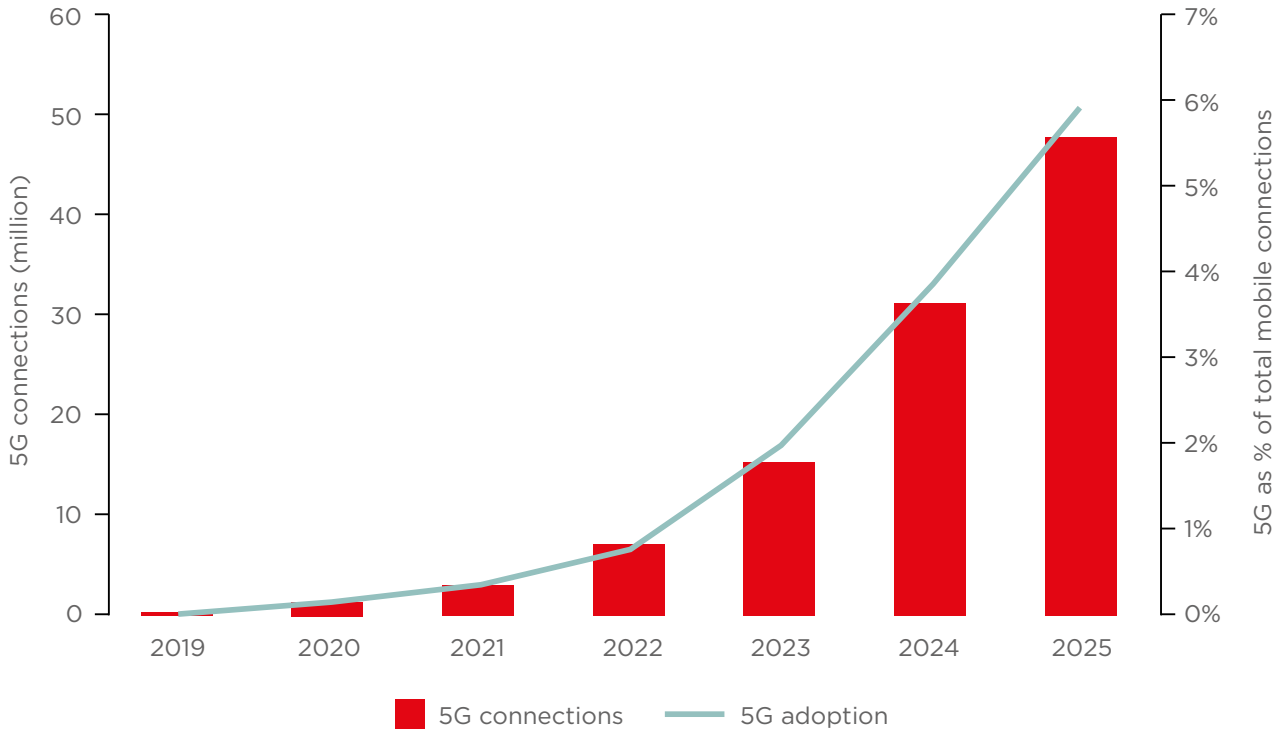## 5.1 5G customer adoption will reach 16% in the GCC Arab States by 2025

Between 2019 and 2025, 15 countries plan to launch 5G mobile services in the MENA region. Compared to 4G, more markets are set to be involved in the first run of 5G network launches. Looking at the first three years, six MENA countries launched 4G commercial services during 2009-2011 compared to eight countries launching 5G during 2019-2021. However, compared to 4G, 5G will likely involve slower network rollout, smaller population coverage and possibly slower customer adoption given that 4G has still room for connections growth and routes to monetisation.

According to GSMA Intelligence, the number of 5G mobile connections in the MENA region will grow slowly in the first two or three years and will start gaining momentum in 2023. By 2025, there will be around 50 million 5G connections, with about 20 million in the GCC Arab States.

Figure 14

5G customer adoption in MENA
Excluding licensed cellular IoT and fixed wireless
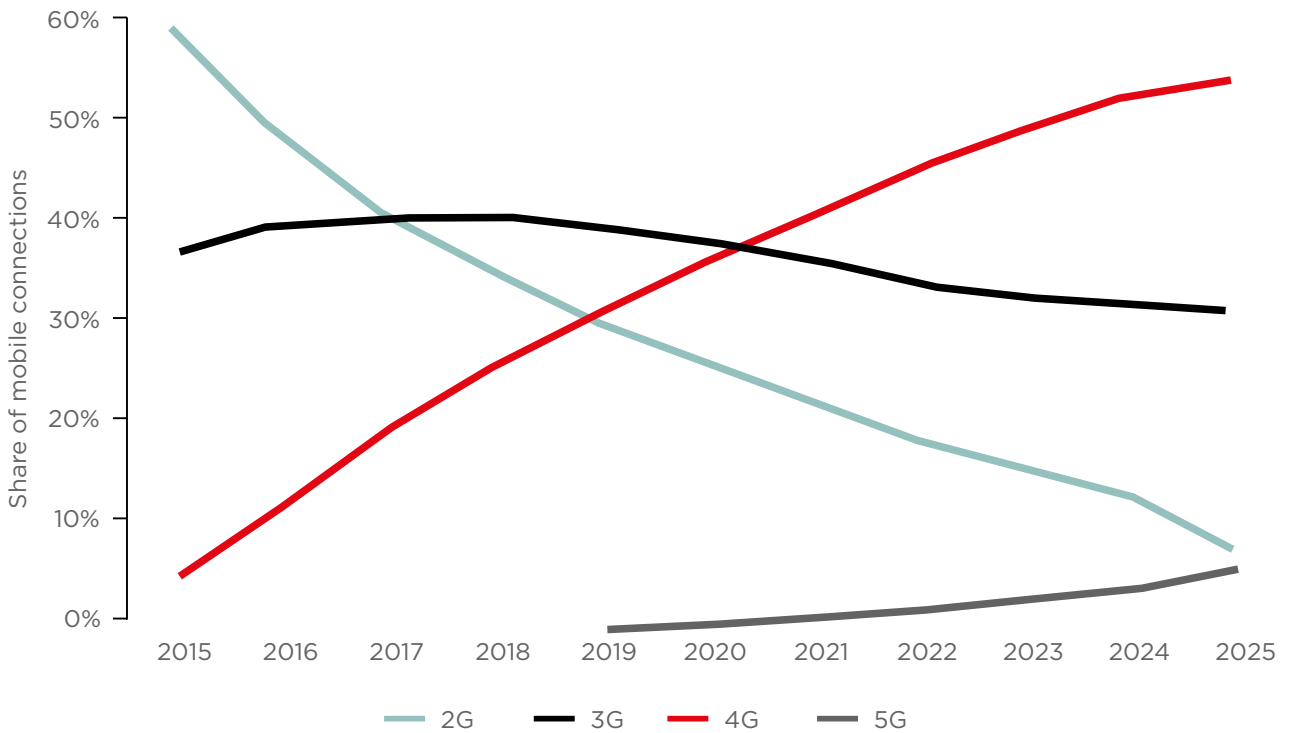

5G connections   5G adoption

Source: GSMA Intelligence

Many operators in the region will continue to focus on LTE deployments over the next five years. As 4G customer adoption is still at 22% of total mobile connections in MENA (as of June 2018), there is significant room for further growth. Only two countries – Turkey (71%) and Saudi Arabia (39%) – have reached 4G adoption rates close to or above the global average of 40%. As such, 4G will account for the vast majority of connections growth between 2018 and 2025, while 5G will reach 6% of total mobile connections.

Figure 15

MENA mobile connections by technology
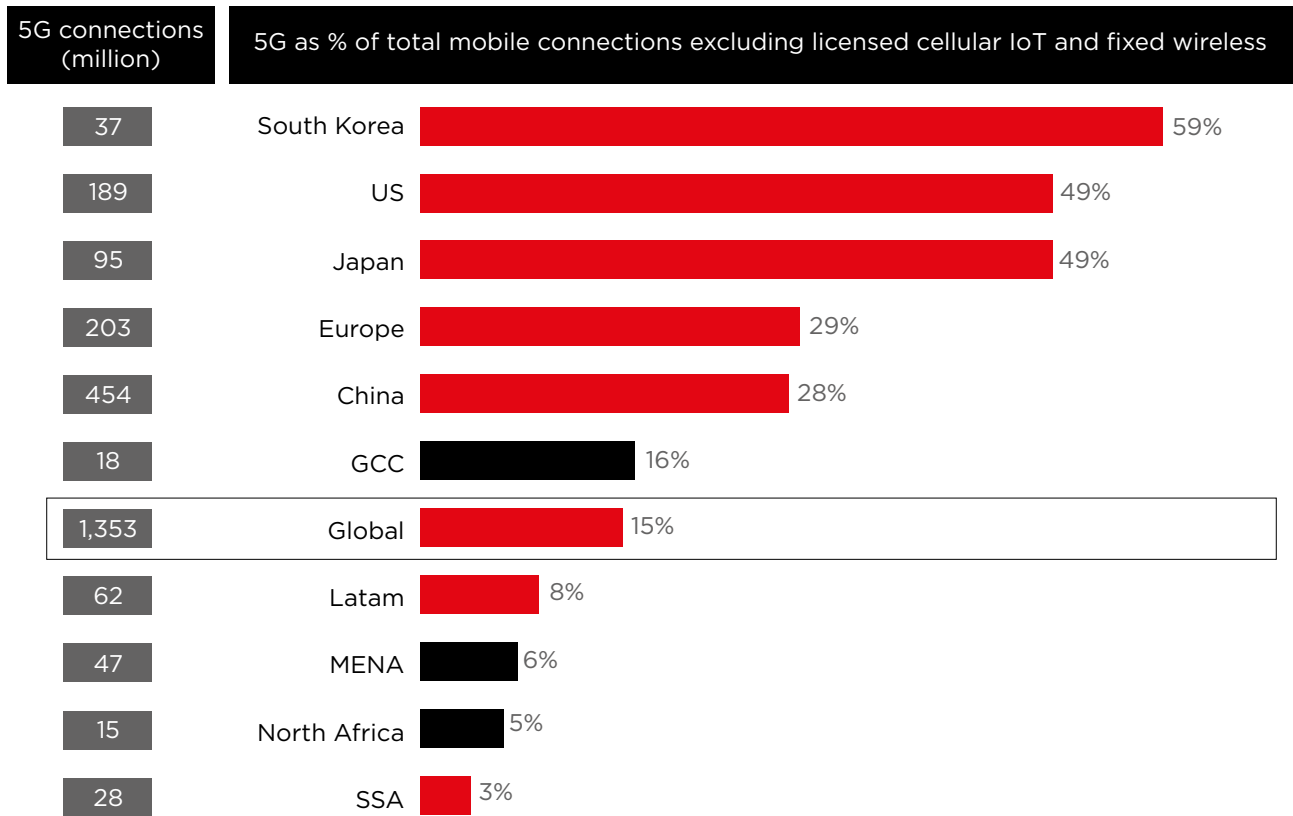Excluding licensed cellular IoT and fixed wireless

Source: GSMA Intelligence

5.2 GCC Arab States broadly in line with global average

Only a few countries globally will reach 5G adoption rates of around 50% by the end of 2025 – South Korea, the US, Australia, Japan and a few markets in Europe. China, the US and Japan will be the top three countries by number of 5G mobile connections in 2025, while Europe as a whole will have around 200 million connections. In total, these four economies will account for 70% of the nearly 1.4 billion 5G mobile connections expected globally by 2025. The GCC Arab States will be slightly ahead of the global average by 2025, with 16% customer adoption (5G as a percentage of total mobile connections), compared to 15% globally.

Figure 16

5G customer adoption across regions and major markets

5G connections (million)	5G as % of total mobile connections excluding licensed cellular IoT and fixed wireless	
37	South Korea	59%
189	US	49%
95	Japan	49%
203	Europe	29%
454	China	28%
18	GCC	16%
1,353	Global	15%
62	Latam	8%
47	MENA	6%
15	North Africa	5%
28	SSA	3%

Source: GSMA Intelligence

6 Policy and regulatory outlook

As the MENA mobile industry moves into the 5G era, appropriate regulatory decisions and a clear policy framework are needed to support 5G network developments, sustainable levels of investment and wider ecosystem evolution.

Operators largely agree that the mobile industry needs to work in partnership with government departments, vendors and other private sector players to expedite rollouts and help fulfil the potential of 5G for consumers and businesses across the region. For most, revisions to policy and regulation in areas such as spectrum, infrastructure and tax could shape, support or even risk the development of 5G and the advancement of the wider mobile ecosystem over the next decade and beyond.

6.1 Policymakers should set out defined spectrum assignment schedules

Spectrum will remain a critical but scarce resource in the 5G era. 5G will require a balanced mix of frequencies within three key ranges (sub-1 GHz, 1-6 GHz and >6 GHz) to deliver population coverage and support consumer and enterprise use cases.[25] Nevertheless, some telecoms regulators in MENA have only recently begun to assess the implications of 5G in terms of spectrum requirements. Operators have expressed concerns that they have little visibility of planned auction dates, available bandwidths and reserve prices in a number of markets, thereby impeding their 5G launch strategies.

Spectrum between 3.4 and 3.8 GHz is a primary candidate for early 5G deployments in most markets, while some countries such as UAE, Oman and Turkey are also looking at 26 and 28 GHz to handle data demand in hotspot areas. However, MENA regulators have not yet assigned mmWave frequencies, while spectrum in the sub-1 GHz frequency range has not been widely considered. Consequently, spectrum will be a significant hurdle to the deployment of 5G in 2019 and 2020, which are widely regarded as target launch dates in most GCC Arab States. Policymakers must therefore move quickly to plan and assign a variety of bands to support 5G use, formulating a comprehensive roadmap that takes into account the necessary preparation period and commits to releasing sufficient quantities of spectrum to mobile operators. This includes bringing mmWave to market on a timely and affordable basis, which could be critical in delivering exceptionally high data throughput for specific industry applications.

5G also requires long-term spectrum availability across all three frequency ranges. By 2023, mobile users in MENA will consume 9.4 EB of mobile data traffic per month (a 48% CAGR from 2017),[26] emphasising the need to assign additional spectrum to help expand network capacity. Spectrum assigned to operators on an exclusive basis will be crucial to 5G development as it allows quality control and the maximum potential to be realised. Licensed bandwidth is the preferred spectrum management model to guarantee the vital long-term infrastructure investment required for 5G. MENA operators might also require unlicensed spectrum to ease capacity constraints, though this is not a priority across the board.

To encourage spectrum refarming, regulators in MENA should avoid designating bands solely for specific mobile network technologies and instead take a neutral approach. In early 4G developments, regulators in some countries allowed the use of spectrum bands initially employed for earlier network generations (2G and 3G) to deliver 4G services. Operators should be given the flexibility to repurpose some of the existing spectrum bands for 5G in certain locations and markets, to make the most of valuable assets and help fulfil the projected demand for 5G services. For many MENA operators, refarming of existing spectrum bands will be evaluated as the 5G ecosystem matures (adoption and use cases).

In addition, policymakers should consider the role of licence duration and renewal, and the likely costs of 5G deployment. The prospect of licence expiry creates significant uncertainty for operators, which stifles investment. A transparent, predictable and coherent approach to licence renewal is therefore important, enabling operators to make rational, long-term capex decisions. Licence fees should be charged on an administrative pricing basis rather than being set to maximise government revenue, which could hamper the mobile industry's ability to deliver advanced connectivity across the region, and in turn prevent the region from reaping the potential socioeconomic benefits of 5G.

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[25]Further information available at https://www.gsma.com/spectrum/5g-spectrum-policy-position/
[26]Ericsson Mobility Report: with Middle East and Africa appendix, 2017

6.2 Updates to infrastructure rules are fundamental to cost-effective 5G deployment

With 5G technology promising to enable a new wave of products, services and industrial advances across the region's economy, it is imperative that mobile operators find the means to deploy the underlying infrastructure to support the future digital landscape. At the same time, there should be recognition that, to achieve governments' policy objectives for digital development, operators must have the resources to extend and enhance their networks, and the commercial justification for ongoing investment.

Across MENA, access to cell sites and lease costs will be principal barriers to the rollout of 5G services. This is especially the case for small cells, which can provide additional capacity in congested areas where space for sites and towers is limited, and where coping with rising data usage is most challenging. 5G networks are expected to consist of up to 10 times more mobile sites than their predecessors, increasing the demand for access to sites and rights of way as operators use a dense population of small cells in urban and suburban areas to deliver the advanced levels of performance and reliability that consumers and industries will require. However, in some countries, the current methodology for negotiating access to a new site results in prohibitive lease prices, which impede effective network densification. Consequently, regulators should champion a simplified and harmonised approach to small cell buildout and site approval that guarantees reasonable prices and security of tenure and renewal.

There is general consensus that mobile operators that also own fibre infrastructure would have a distinct competitive advantage in their preparations for 5G as their assets could be leveraged to deliver high-capacity backhaul requirements. Having a good proportion of mobile sites connected with fibre could benefit the pace of rollout and lessen future implementation costs, although certain spectrum bands (mmWave) may offer the potential for in-band backhaul solutions, thereby reducing the need for widespread fibre deployment. Also, in some MENA markets, competition in the fixed markets is not as intense as in mobile, thus limiting fibre rollout initiatives. To help overcome backhaul as a possible hurdle to successful 5G rollout, some MENA mobile operators recommend regulators adopt a "one window operation"[27] for rights-of-way applications. Others have called for information around planned backhaul deployments by state-run broadband delivery vehicles; the availability of state subsidies; and the potential for greater wholesale regulation.

Further, operators in MENA indicate that they will lean on the experience gained from 4G network sharing as they look to manage the capital and operational costs of 5G deployment through site co-location and the sharing of municipal infrastructure. They also believe that 5G could involve a greater sharing of resources between telecoms and utility networks. Telecoms frameworks in the region should therefore allow for the prospect of active and passive infrastructure sharing, driven by commercial bilateral arrangements, which could drive efficiencies and reduce 5G deployment costs.

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[27]Also known as a single-window system.

6.3 Regulation should evolve to deliver socioeconomic benefits of 5G

The economics of 5G for mobile operators are still somewhat unclear in the MENA region and around the globe. Much of the focus so far has been on 5G trials and early commercial launches, but finding the 5G business model is the major challenge. This is a challenge not only for operators but also the wider mobile sector and other industries expected to benefit from 5G network capabilities.

Timing is also key since the financial backdrop for mobile operators in MENA is more challenging than ever. Average annual mobile revenue growth for the region will be 2.2% between 2018 and 2025, compared to the high single digits witnessed at the start of the decade. There is broad consensus that over time 5G will help fuel incremental revenue for operators, but for some 5G use cases, mainstream adoption in the more developed MENA markets is five or more years away.

Nevertheless, the mobile sector is looking to 5G to meet the demands of a digitised world and is preparing to make heavy investments in the coming years. The need for pro-investment, pro-innovation policies and modernised regulatory regimes has never been more pressing. As 5G begins to take root in the region's pioneer markets, policymakers should establish forward-looking regulatory frameworks that reflect technological change and are sufficiently flexible and dynamic to keep pace with the evolving digital ecosystem. By addressing the new business drivers and challenges that operators face in meeting demand for high-density networks, policy can create an environment conducive to investment.

In MENA's less digitally advanced countries, governments and regulators should view 5G as an enabler of wider economic growth, societal progress and industry transformation, as well as a technology that can enhance the livelihood of citizens for years to come. For 5G to be the linchpin of future digital economies, policymakers must adopt best-practice approaches across the board, particularly in spectrum allocation, infrastructure access and network sharing.

To that end, policymakers in some markets should consider reforms to their prevailing tax regimes and, in particular, sector-specific taxes, which can have distortive effects but are common across MENA.[28] GSMA research highlights that Jordan, Tunisia and Turkey all have excise taxes on usage, while Algeria raised the tax on mobile prepaid recharges from 5% to 7% in 2017. Lowering or removing mobile-specific taxes can improve affordability, boost adoption and digital inclusion, encourage investment and increase government revenues in the medium to long term.[29]

[28]Delivering mobile connectivity in MENA: A review of mobile sector taxation and licence extension, GSMA, 2017
[29]This issue is particularly relevant to Turkey and Jordan where the most significant obstacle to further mobile internet adoption in both countries is affordability. For more detail see, State of Mobile Internet Connectivity 2018, GSMA Intelligence and GSMA Connected Society, 2018

Mobile industry journey to 5G – what next?

2018 has been a milestone year for the global mobile industry with a few operators around the globe moving from 5G trials to early commercialisation. 5G momentum will intensify in 2019 and 2020 as further commercial launches are planned across North America, Europe, the Middle East and Asia Pacific.

During the same timeframe, continuous work is expected across the industry on various key areas, including spectrum (WRC-19), standards and specifications (R16, R17, IMT-2020), network deployments and trials. The first 5G smartphones will also be available in 2019. Further ahead, 5G will become available to consumers and enterprises in more than 50 markets globally by the end of 2025, and will account for nearly 1.4 billion mobile connections by then.

In 2019 and beyond, the GSMA will continue to bring together all stakeholders in the mobile industry to support further progress with 5G. By working closely with its members and other players in the ecosystem, the GSMA will focus on how to help define the technologies, identify the spectrum bands and develop the business models and policy initiatives that will bring 5G to life. The GSMA will also continue to monitor and report on 5G developments across all key areas, including spectrum, trials, commercial launches, network coverage and customer adoption.

GSMA Head Office
Floor 2
The Walbrook Building
25 Walbrook
London EC4N 8AF
United Kingdom
Tel: +44 (0)20 7356 0600
Fax: +44 (0)20 7356 0601