SAMENA
TELECOMMUNICATIONS COUNCIL
BUILDING DIGITAL ECONOMIES

REGIONAL 5G ROADMAP

Accelerating 5G Terrestrial Deployment

info@samenacouncil.org | www.samenacouncil.org | +971.4.3642700

ABSTRACT

This paper examines the commercial background to the deployment of 5G in the MENA region, looking at costs and benefits, as well as uncertainties. Uncertainties could act as a block to early investment in 5G. This is further compounded by where we are in the mobile technology cycle, with 4G only being deployed a couple of years ago in many markets. Previous mobile technology cycles (such as for 2G and 3G) have seen around a ten-year gap between deployment of mobile technologies. The investment environment has also changed in the region with relatively flat mobile revenues, and subscriber penetration in recent years.

The paper explores some possible actions that might be taken in cooperation with regulators and industry to help promote early 5G investment. A study for the EU has suggested that the benefits of 5G could outweigh the costs by nearly 3:1. Even so, there is uncertainty about if these extra benefits of 5G can be captured by the mobile operators who (it is assumed) will need to make the investments. Collaborative action to facilitate discussions with key vertical use cases such as Health and Transport could help. Spectrum policy will also be a key factor.

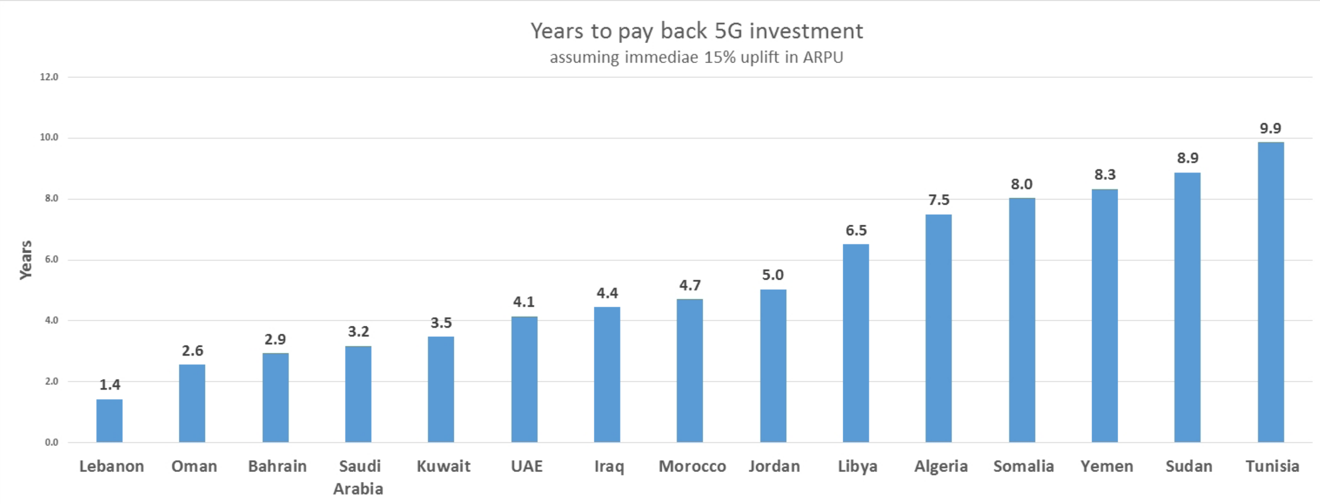
SAMENA Telecommunications Council Principal Contact Person:

Mr. Roberto Ercole
Director Public Policy & Regulatory Affairs

#304, Alfa Building, Knowledge Village,
P.O. Box: 502544, Dubai, UAE.
p: +971 4 364 27 00
m: +44 79 173 74750
f: +971 4 369 75
e: roberto@samenacouncil.org

Findings

Using a simple payback period analysis shows a payback period from around 1.4 years in Lebanon to nearly 10 years in Tunisia from when significant 5G revenues begin.



The diagram above suggests that countries towards the right part of the table may need stronger incentives to encourage early 5G roll-out than those on the left. In practice however extra 5G revenues will not begin at 15% but will ramp up over time. It is likely that for the first two years extra 5G revenues will not be significant. Extra revenue would then begin to grow as 5G devices are more widely adopted, as for example shown below in the 4G adoption curve. This will significantly increase 5G payback periods.

Potential Issues that could help early 5G deployment

Several factors could be considered to help with the commercial attractiveness of 5G, and so accelerate its deployment in the region. These include:

1. Facilitating discussions between key verticals and mobile – especially where verticals are heavily regulated;

2. Restructuring of licence/spectrum fees, taxes, site approval /planning and similar issues to lessen the costs on 5G deployment;

3. Consider the impact of regulations on cross border data transfer (data protection and data sovereignty) on 5G networks that will need to share network elements in one country with their networks in others (i.e. servers in UAE dealing with data from Oman) – Cloud based networks.

4. Ensuring there is a clear future 4G/5G spectrum roadmap (for say 5 years) to allow operators to make efficient investment decisions on how deal with the growth in data demand.

5. Ensure that future harmonised 5G spectrum to be discussed at WRC-19 is suitable for mobile.

SAMENA's High Level Goals

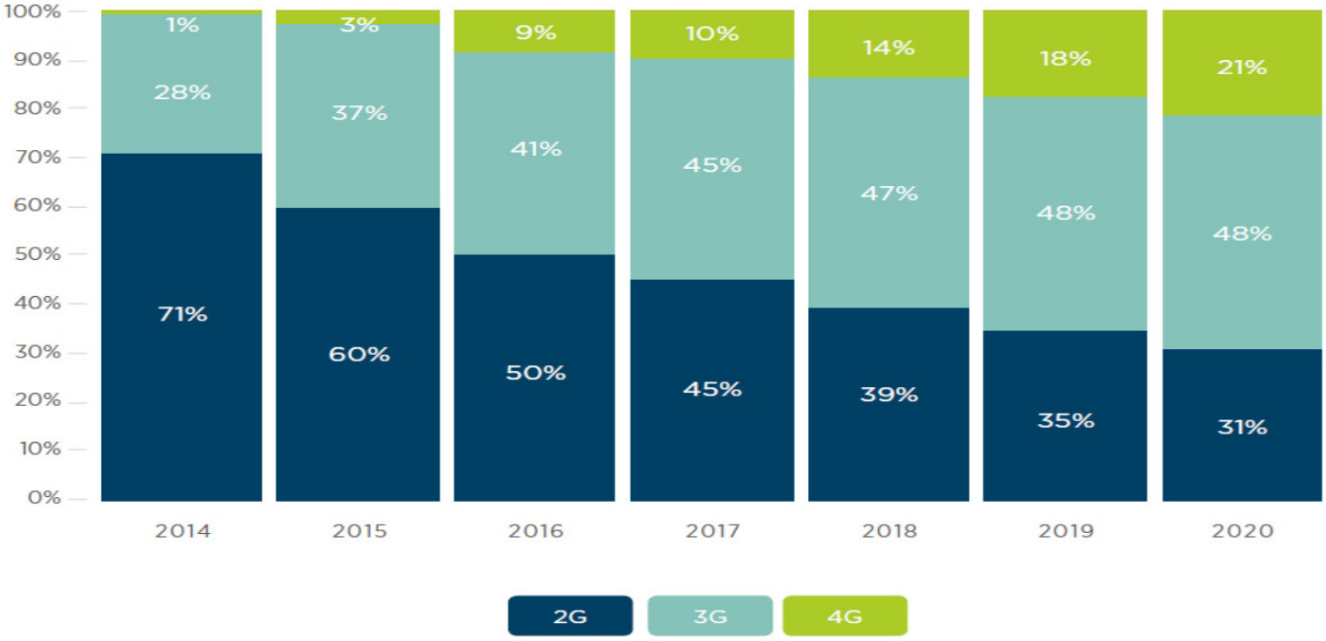
SAMENA Council is in pursuit of broadband investment-friendly policies, futuristic regulations and good governance, analysing and encouraging the adoption of digital services, and promoting the need to collaborate and work together, to mutually address issues that drive business strategies and investment decisions for ensuring a sustainable future.

SAMENA believes that spectrum policy and discussions should therefore take into consideration what potential impact possible spectrum policies may have on commercial deployment of services such as 5G/IMT 2020 and beyond. In this way it will be possible, for administrations that wish to, for 5G services to have the best chance of early widespread deployment in their markets.

It should be noted that none of the data used in the 5G investment analysis has been provided by the operators directly and has been sourced via publicly available data.

Background

The deployment of 5G/IMT 2020 and beyond[1] services are seen as important by many administrations in the region. Some regulators wish to see test 5G networks begin very shortly, and mass market wide-area deployment within a couple of years. However, the investments in 5G networks is expected to come from mobile operators, who will be expected to make a commercial business case on the profitability of 5G. The figure below gives connections by technology for the region over time and shows where the region is in the business cycle for mobile.



Source: GSMA

The large-scale deployment of 4G began in many markets round 2016, with 3G and 4G penetration at around 45% and 10% respectively at the end of 2017[2]. Looking at previous investment cycles would suggest large scale 5G deployment perhaps in the year 2026. For this date is to be driven forward significantly requires that the extra capabilities of 5G need to be sufficiently attractive. These new 5G capabilities are currently envisaged to cover three main areas:

1. Massive Machine to Machine Communication (IOT);
2. Enhanced Mobile Broadband (higher data rates); and
3. Ultra-Reliable Communications (emergency services).

[1] The terms 5G and IMT 2020 and beyond are used interchangeably in this paper.
[2] Source: GSMA Mobile Economy Report for MENA – 2017.

Discussion

The aim of this paper is to examine the potential investments required to build a wide-area 5G network in several example MENA countries, based on a high-level analysis. A cost has been derived for implementing each generation of mobile technology based on a per subscriber figure (using figures adapted from other regions). This figure is then compared with average revenue per subscriber in these markets to give an idea of the scale of the investment commitment needed. The paper then examines what the payback period might be based on various assumptions on increased average revenue per user (ARPU). Whilst the methodology is crude it does give an idea of the scale of the challenge, as well as where uncertainties lie. It is then possible to discuss how to reduce these uncertainties to help promote early 5G investment.

One key issue that arises from the analysis is that there is a much larger uncertainty in the extra revenues (over and above 4G) that 5G might generate than on costs of deployment. This uncertainty on extra revenue is reflected in the apparent lack of clear use cases in key verticals such as Heath, and Transport. Whilst a high-level analysis has been done on the potential benefits of 5G to economies as a whole, it is not clear what part of this can be captured by the mobile operators.

The paper then examines potential issues relating to 5G investment and regulation and suggests possible ways forward that seek to reduce investment uncertainty, and potentially deployment costs. In this way administrations that wish to promote the early deployment of 5G could consider such measures. Some measures require collective international coordination, and others are national issues.

Specific issues that could impact on 5G deployment and investments include:

1. Better understanding on potential future 5G revenues for operators from key verticals such as Health and Transport;

2. Current spectrum availability/benchmarking, and spectrum roadmaps for future availability;

3. Reduction in costs for deploying base stations (local taxes, approvals, access to sites etc.);

4. Certainty on future 5G band availability and technical conditions; and

5. Fees charged for spectrum to account for the need to deliver higher data rates at lower costs (reduced cost per bit).

5G Deployment Costs

SAMENA believes that to allow national administrations to tailor their policies on 5G to encourage their national development and investment objectives requires an understanding of the costs involved with deploying commercial 5G networks. To help facilitate the discussion SAMENA has undertaken this high-level analysis, that could be used as a starting point for national debates, in cooperation with local stakeholders such as mobile network operators. It should be stressed this analysis is an initial attempt to help promote discussion.

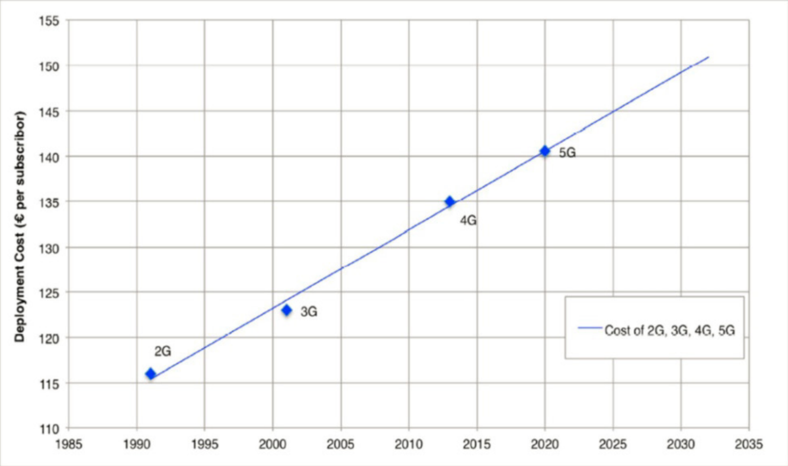


Figure 1

An analysis was carried out for the EU[3] looking at 5G deployment costs in the EU28. The report found that the costs of deploying each new mobile technology was given by the diagram below.

The report suggests that if commercial 5G deployment began in 2020 it would cost around €140 per subscriber (in the EU28).

Modifications to this flat figure of €140 were made to suit national markets (using relative GDP per capita). This is discussed in Annex 1. For example, it is assumed that in UAE this figure is slightly higher at €156, whereas in Joran it is lower at €54 per subscriber (as compared the €140 EU figure).

The results are shown below for some example countries.

It can be seen from Figure 2 that the absolute costs are substantial. The implicit assumption is that the 5G deployment is for a wide-area network with access to higher bands for capacity, and lower bands (such as 700 MHz) for coverage. It would obviously cost much less to deploy localised hot-spots of 5G, but this might not deliver the social and economic objectives of some administrations.

Given the current financial climate every effort should be made to reduce uncertainty in investment, where possible. Large payments/fees for spectrum could also impact on the business case.

However, the data in Figure 2 is only a high-level analysis, and each administration would need to make its own investigation based on discussions with their national mobile operators. Also, it is not the absolute figure that needs to be considered alone. The profitability is also essential to understand the commercial imperative.

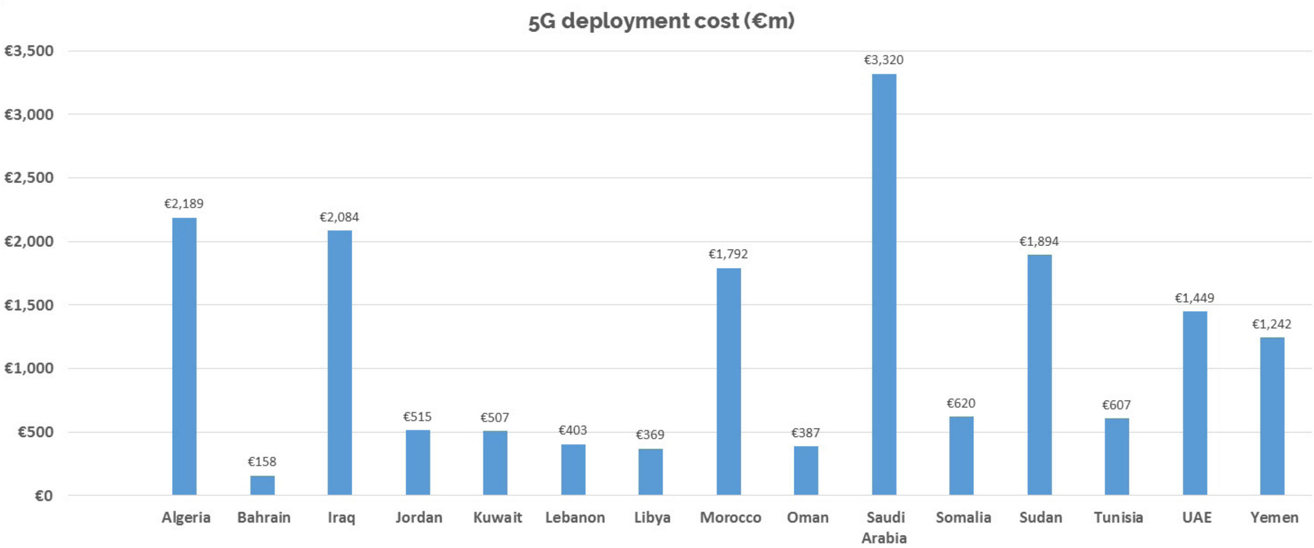


Figure 2

[3] "Identification and quantification of key socio-economic data to support strategic planning of the introduction of 5G in Europe" – 2016, by Trinity College Dublin, Real Wireless et al.

Potential Revenue to pay for Investment

The other element to this analysis then, must be the potential extra revenue that can be generated from 5G (over and above what 4G and its upgrades can offer). The EU study looks at several potential sources of new revenue, not all of which would fall to a mobile operator (i.e. "trickle-down" or multiplier effects). As it is the mobile operators that will need to make the investments in 5G (under current assumptions), this could be a problem. Mobile operators will need to develop robust business cases to justify such large investments to their shareholders.

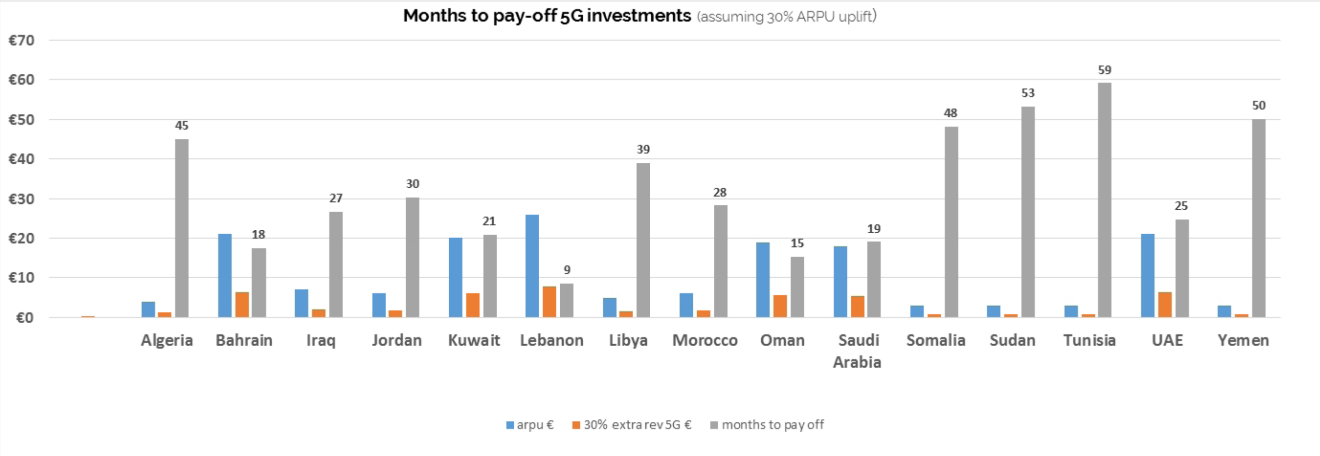


Figure 3

The exact figure of these extra revenues from 5G is uncertain. Industry sources seem to suggest that for mobile operators at least, revenues could be boosted by 10% to 40% by 2026. It is also likely that initially the extra 5G revenues will be smaller, and then grow over time. In a more sophisticated business analysis, such as Net Present Value (NPV), these timings of revenue versus spend could have a major impact on a business case.

Such an NPV analysis would also allow operators to test more detailed scenarios such as delaying 5G investment for a number of years, to allow the eco-system to develop. This could provide greater certainty on some parameters (such as new revenue potential) as well as allow economies of scale to grow and hence reduce equipment costs.

The exact timings and amount of costs and benefits will of course vary from market to market, as well as operator to operator, and such an analysis is beyond the scope of this paper. However, making simple assumptions can highlight the sensitivities as well as which are the key assumptions to be tested.

The assumption here is that current average revenue per user (ARPU) is boosted by fixed amount from 15% to 30%. Figure 3 shows the output of assuming a 30% increase in the ARPU in the countries below (as well as current arpu).

It can be seen from Figures 2 and 3 above that 5G requires a significant level of commitment from the mobile operators. For example, UAE has a payback period of 25 months, whereas Yemen has a payback period of 50 months or just over 4 years (assuming a 30% revenue uplift).

As an international benchmark, if one assumes €50 ARPU per month for the US, and a 30% revenue uplift (with €140 cost per subscriber), that gives a payback period of around 9 months for the United States. This would seem to agree with what is happening now internationally, and US companies deploying commercial 5G (or pre-5G) now.

As a preliminary sensitivity analysis, if the ARPU uplift was only 15%, this would halve the extra revenue, which doubles the payback period, and is shown below. However, in practice it will take several years for 5G device numbers to grow, and hence deliver extra 5G revenues. If one assumes a similar adoption curve to the one, we have seen for 4G suggests very little extra revenues in the first two years. Even after six years only 21% of devices might be 5G.

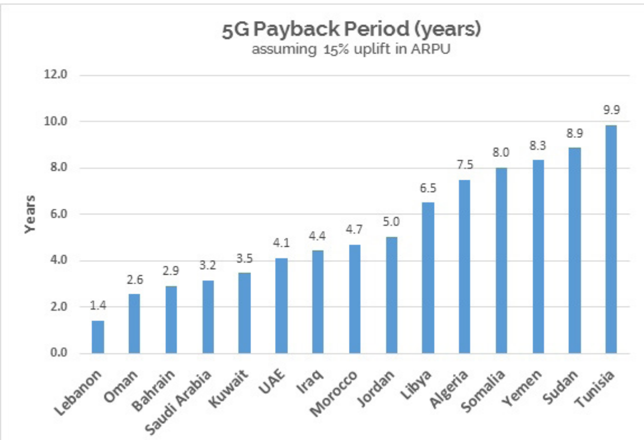


Figure 4

Spectrum Policy Issues

Spectrum will be a key issue for the success of 5G deployment, and a large amount of effort is going into the standardisation of the necessary frequency bands, as well as the required sharing studies. It will be important that the frequency bands needed for 5G should be made available in good time for mobile operators to deploy. If this is not the case, then mobile operators may make inefficient investment decisions to cater for growing data demand.

Normally (all other things being equal, and spectrum fees not being a major issue) the cheapest way to increase capacity is by adding more harmonised spectrum to a network. If an operator is uncertain about when such spectrum would be made available, then they may be forced to build more radio sites (and hence spend more money/make an inefficient investments) or increase prices to ration supply. Neither option is in the long-term interests of users or the economy.

According to data available to SAMENA (which needs to be verified) there is a wide range in spectrum licenced for mobile across the region, as shown below.

It is not necessary that all mobile bands be available in all countries, but what would be beneficial would be a roadmap of when the spectrum is likely to be made available and by what mechanism and on what terms.

Key bands for mobile operators going forward will be bands below 1 GHz such as 700 MHz (for coverage) and 5G initial capacity bands such as 3.4 - 3.8 GHz (C-Band). This 400 MHz of C-Band spectrum is included in the 1200 MHz figure. It is considered by many sources that mobile operators will require around 100 MHz of contiguous spectrum each from the C-band, to make it as attractive as possible to deploy 5G. In the longer term 26 GHz spectrum will be required, and some are assuming that mobile operators will require around 1 GHz of spectrum each in this band.

There are however uncertainties regarding the 3.4 – 3.8 GHz band, regarding the cross-border sharing arrangements for the upper half of this band (3.6 – 3.8 GHz). Unfortunately, the last World Radio-communication Conference[4] in 2015 did not identify the upper half of band for 5G. This could potentially make deployment of 5G more complex, where neighbouring countries continue to use other services protected by international treaty (Radio Regulations). It appears unlikely that the next WRC (in Egypt in 2019) will address this issue.

Studies in the ITU are currently considering the technical cross-border sharing conditions of the 26 GHz band in the run-up to WRC-19. These studies are not agreed and many on the mobile side have concerns that some of the proposed mobile emission limits may significantly add to the cost of network deployment.

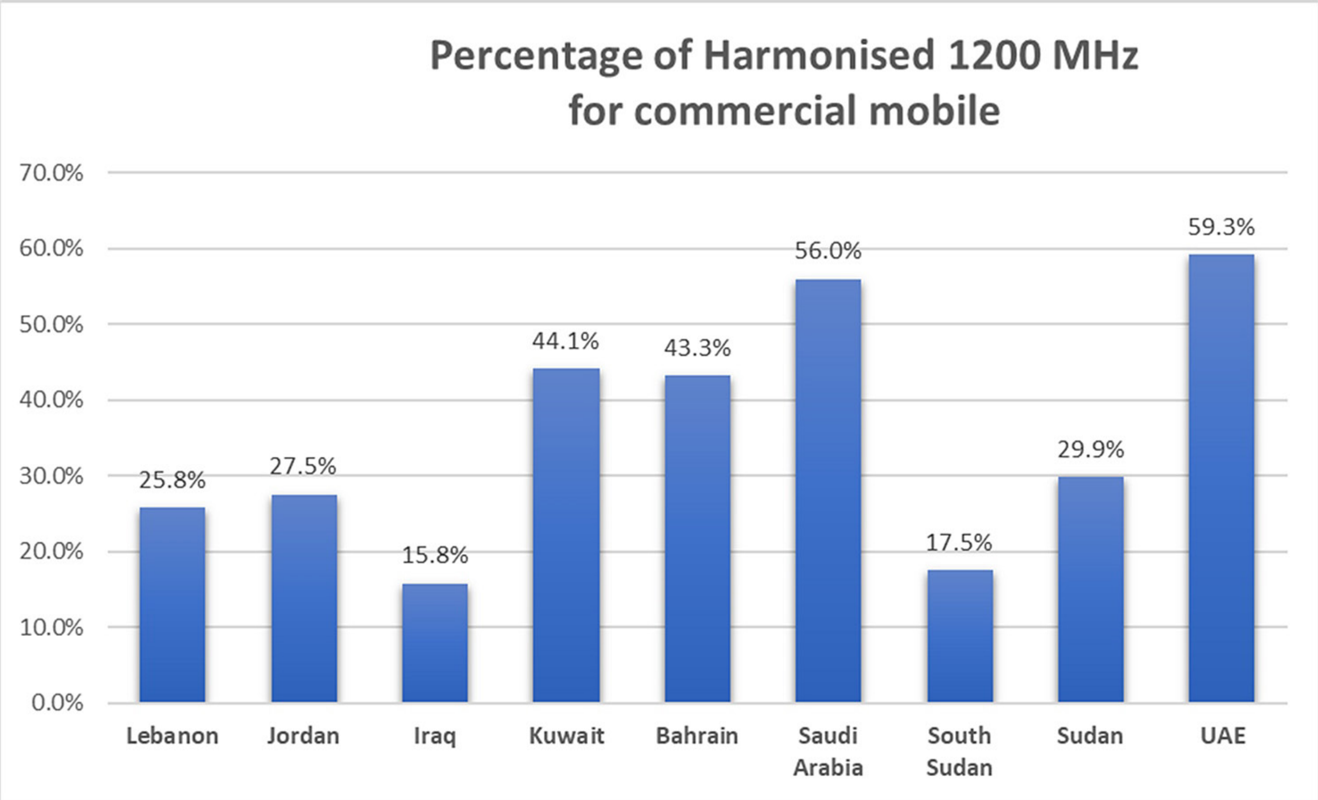


Figure 5

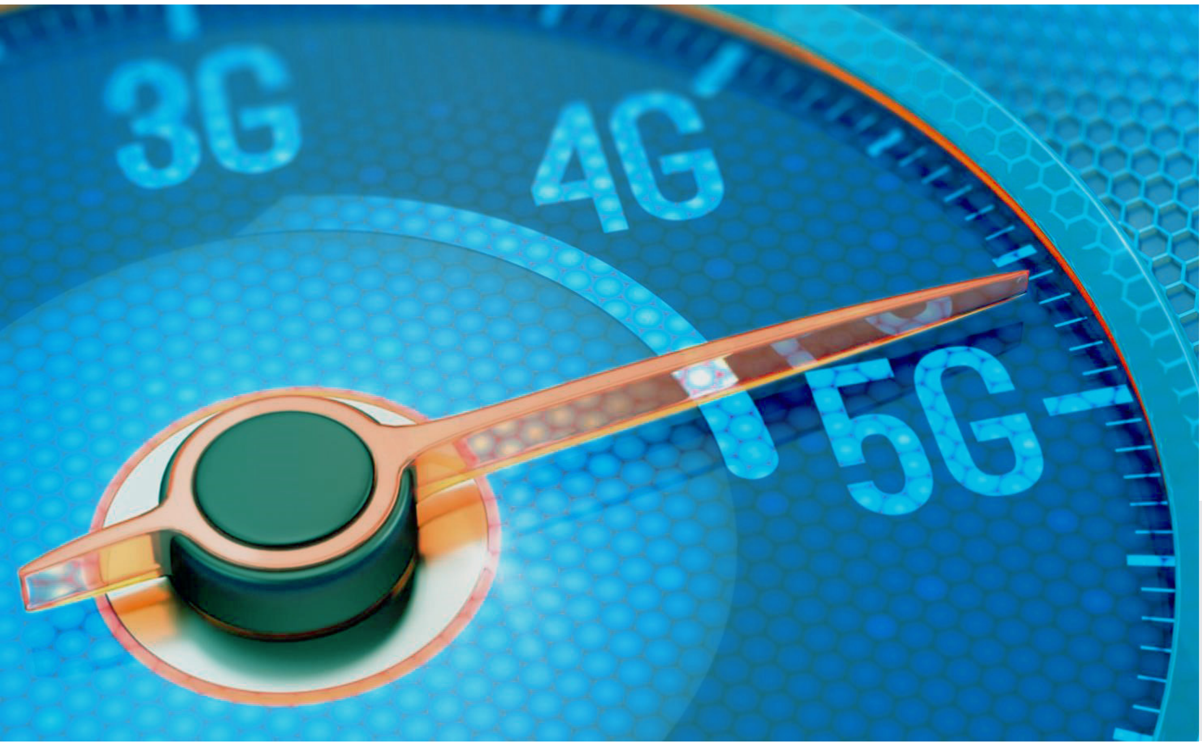
[4] https://www.itu.int/en/ITU-R/conferences/wrc/2019/Pages/default.aspx

Conclusion

Substantial financial commitments will be required from the mobile industry to fund the deployment of 5G in the region. To help ease uncertainty (which increases risk and hence costs) requires that administrations (which have early 5G deployment as a national objective) consider such issues.

One key uncertainty is the extra revenue 5G will provide over and above what 4G could provide (and when). Allowing small scale trial networks could help with this. Also helping to facilitate discussions between key verticals and mobile could be beneficial. This is especially true in markets where some key verticals are heavily regulated or have some element of state control. Other specifics are:

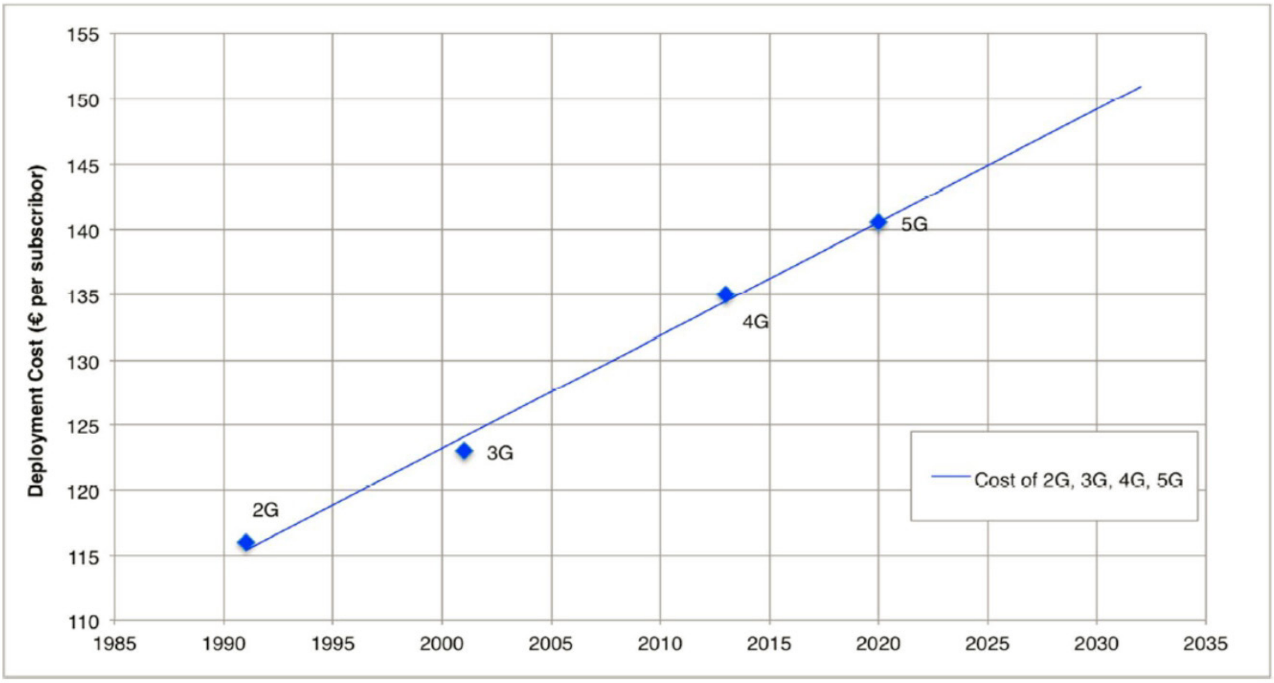
- Restructuring of licence/spectrum fees, taxes, site approval /planning and similar issues to lessen the costs on 5G deployment;
- Consider the impact of regulations on cross border data transfer (data protection and data sovereignty) on 5G networks that will need to share network elements in one country with their networks in others (i.e. servers in UAE dealing with data from Oman) – Cloud based networks;
- Ensuring there is a clear future 4G/5G spectrum roadmap (for say 5 years) to allow operators to make efficient investment decisions on how deal with the growth in data demand;
- Ensure that future harmonised 5G spectrum to be discussed at WRC-19 is suitable for mobile; and
- Spectrum Policy.



Annex 1

Methodology for 5G Deployment Cost Analysis

The analysis is based on a study carried out for the EU[5], that suggests that each successive generation of mobile infrastructure becomes more expensive. This is due to more spectrum and more cells. The study estimates the costs for the EU28 will be €56 billion in 2020. It further estimates a benefit of €141 billion, however this will not all be able to be captured by mobile operators. The report suggests that if commercial deployment began in 2020 it would cost around €140 per subscriber (in the EU28). This rises to €145 per subscriber in 2025. It is further suggested in the report that high level linear extrapolation methods are reasonable because every generation has followed consistent trend lines (as each successive generation is an improvement on the last one). The relevant figure from the EU report is given in below.



https://ec.europa.eu/digital-single-market/en/news/5g-deployment-could-bring-millions-jobs-and-billions-euros-benefits-study-finds

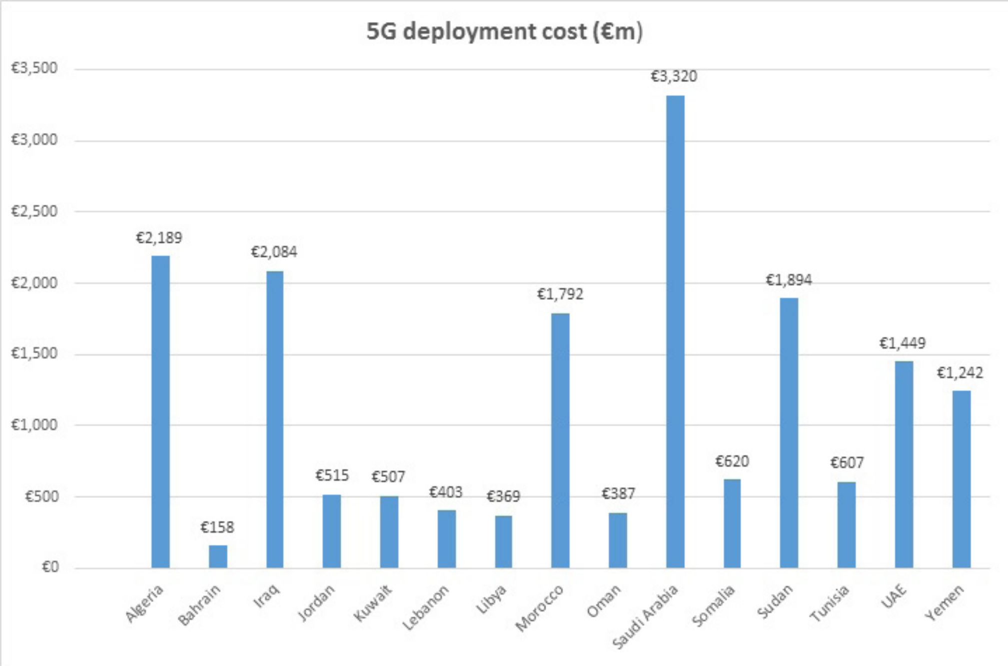
To apply the EU €140 figure per subscriber to the MENA region requires an adjustment to be made, if the method is to be even roughly accurate at a high level. An initial version of this analysis was presented to MENA regulators in Barcelona, and 50% of the €140 figure was used. Feed-back from that meeting asked for further thought to be given to this assumption. To address this a further refinement has been added.

Namely, that two assumptions be made to help reflect the diversity of national conditions within the MENA region:

1. That 70% of 5G subscriber costs go towards things that are primarily priced based on local market conditions – "local" costs. These "local" costs need to be adjusted to account for national market conditions. Relative GDP per Capita (to the EU) is used.
2. The remaining 30% of costs towards 5G subscribers will depend on the costs of items that need to be imported to the country – "international" costs. These costs will be (more or less) the same for all national markets and will not be adjusted. That is that €42 per subscriber is a fixed cost in all markets. This accounts for things like the import of 5G radio equipment.

Using assumptions 1 and 2 it is possible to estimate (at a high level) an indicative cost of 5G deployment in MENA countries. This is shown in the diagram below.

[5] "Identification and quantification of key socio-economic data to support strategic planning of the introduction of 5G in Europe" – 2016, by Trinity College Dublin, Real Wireless et al.



The data in the above figure is only a high-level analysis, and each administration would need to make its own investigation based on discussions with their national mobile operators. The exact figures used in terms of deployment cost per subscriber is given below.

Potential Uncertainties in cost analysis

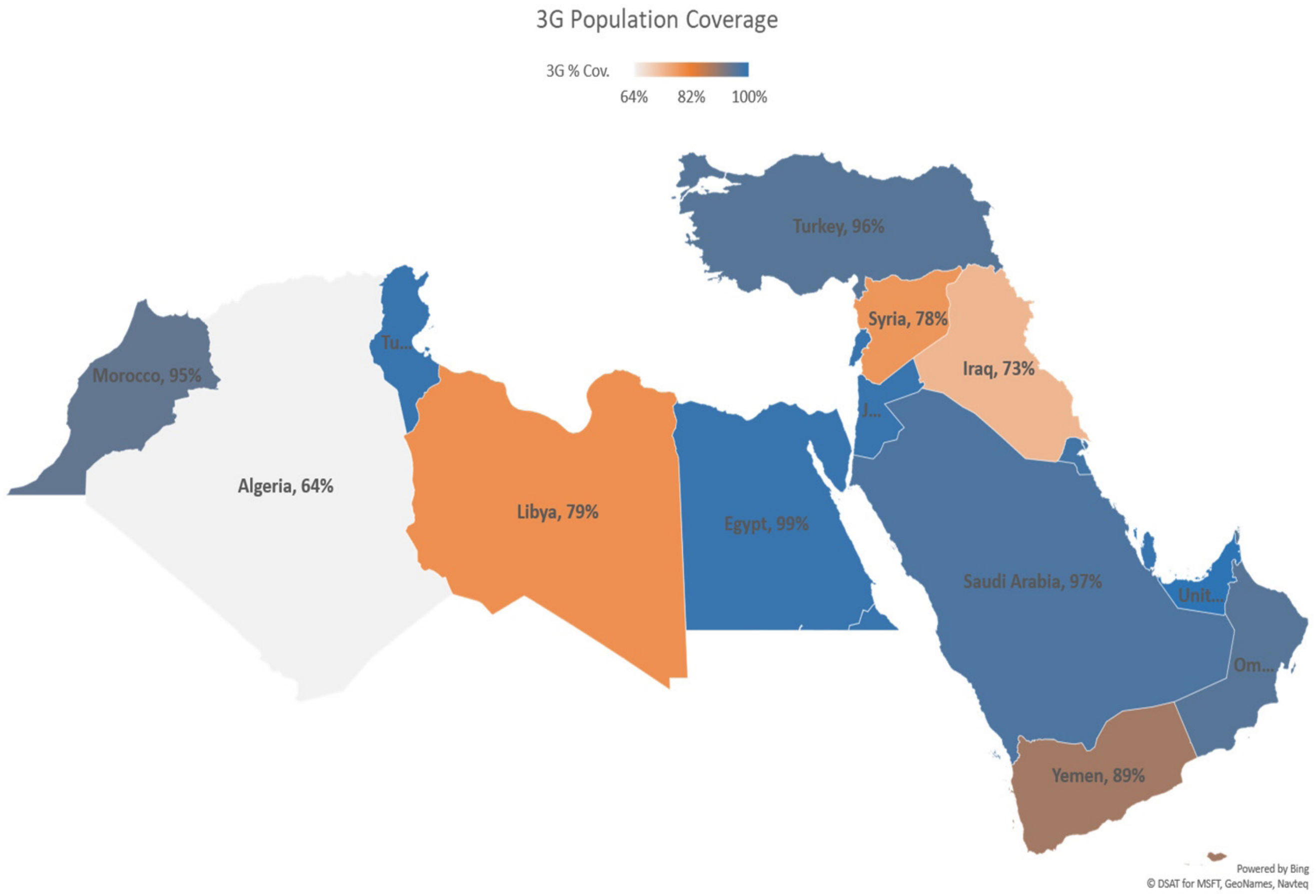
One uncertainty in such figures is what sort of coverage this level of investment would bring. This has not been explored in detail in the EU report, and the EU28 includes a wide range of country sizes, from small and dense, to quite large. Most EU countries have 3G geographic coverage of well over 90%. For MENA countries Annex 2 shows population percentage coverage as of the end of 2016 according to ITU statistics. There are a range of values, but the majority are around 90% or more, which suggests that differences in coverage between EU and MENA may not be a significant driver of costs. From a purely engineering point of view, one would expect geographic coverage to be driven in large part by access to harmonised sub-1GHz spectrum bands (such as 700 and 800 MHz).

Data per Country on ARPU and cost per 5G subscriber

COUNTRY	AVERAGE REVENUE PER SUB (ARPU)	30% EXTRA REVENUE FROM 5G	MONTHS TO PAY OFF 5G INVESTMENT	5G COST PER USER
Algeria	€4	€1.2	45	€53.9
Bahrain	€21	€6.3	18	€110.6
Iraq	€7	€2.1	27	€56.0
Jordan	€6	€1.8	30	€54.4
Kuwait	€20	€6.0	21	€125.2
Lebanon	€26	€7.8	9	€67.1
Libya	€5	€1.5	39	€58.6
Morocco	€6	€1.8	28	€50.8
Oman	€19	€5.7	15	€87.5
Saudi Arabia	€18	€5.4	19	€102.9
Somalia	€3	€0.9	48	€43.3
Sudan	€3	€0.9	53	€47.8
Tunisia	€3	€0.9	59	€53.2
UAE	€21	€6.3	25	€156.4
Yemen	€3	€0.9	50	€45.0

Annex 2

3G Percentage Population Coverage – end 2016



Note – Not all countries are shown fully.

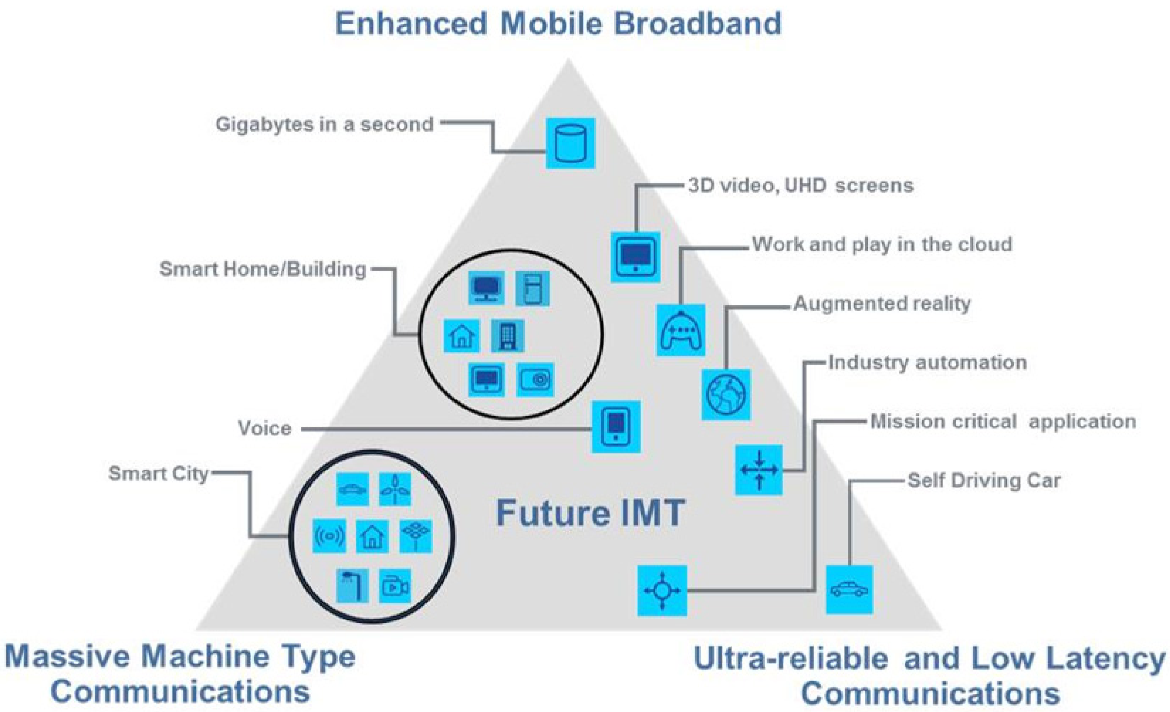
COUNTRY	% POPS COVERAGE	COUNTRY	% POPS COVERAGE
Algeria	64%	Libya	78%
Bahrain	100%	Morocco	95%
Egypt	99%	Oman	96%
Iraq	73%	Qatar	99.5%
Jordan	99%	Saudi Arabia	97%
Kuwait	98%	Syria	78%
Lebanon	99%	Tunisia	99%
UAE	100%	Yemen	89%

Source: ITU - "ICT Indicators Database" (2017)

Annex 3

ITU Vision for 5G/IMT2020 and beyond

Usage scenarios of IMT for 2020 and beyond



Enhancements of key capabilities from IMT-Advanced to IMT-2020