



# The use of fossil fuels in the Middle East and North Africa

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## Question

*What are the projections of use of fossil fuels in the Middle East and North Africa, and what are the trends/efforts to transition to renewable energy across the region?*

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# 1. Summary

This rapid literature review collates evidence from academic and grey literature on the use of fossil fuels in the Middle East and North Africa (MENA). MENA, for much of its recent history, has been known for its energy wealth. The region is, however, significantly diverse, not only in terms of economic and political structures, but also in terms of energy resource and infrastructure.

MENA countries depend heavily on fossil fuels for energy supply and domestic consumption. The region's countries are rapidly growing energy consumers, a product of the growth in gross domestic product (GDP), population, and the pressures of urbanisation. It is estimated that energy demands could increase by more than 5% per annum in the future. Estimates suggest that in 1971 fossil fuel energy consumption represented 95.08% of total regional energy consumption, this peaked in 2008 at 98.71%. As of 2015 fossil fuel energy consumption represented 97.38% of total energy consumed highlighting the limited uptake of alternative fuel sources. The political economy of energy in MENA is characterised by a set of unique regional factors

- the availability of large supplies in conventional oil and gas resources;
- the pivotal role played by hydrocarbon wealth in many MENA oil and gas producers' economic development since the 1960s and 1970s;
- the particular social contract in many MENA countries where energy has, for many decades, been considered a public good to be provided by governments, if not for free, then at prices that have in many cases been merely a fraction of their price in any other international market for most of these countries' modern histories.

Increasing demand across the MENA region is likely to increase stress on fossil fuel usage, because net energy exporters to use their fuel supplies inefficiently, and ultimately strain government finances. Net energy importers also are increasingly cognisant of the volatility of energy prices that threaten energy security. Rising prices for oil on world markets since the early 2000s have raised the cost of imported oil and oil products for MENA net energy importing countries, while many oil and gas producers (net energy exporting countries) divert growing shares of oil and natural gas production away from international markets, to supply domestic demand.

Despite increased demand and a slowly changing energy mix – fossil fuels continue to supply the majority of the MENA region's primary energy needs, around 98% of the region's energy mix. Other than oil and natural gas, only coal has an additional market share, albeit restricted to Morocco and Israel; while hydro-power accounts for the majority of the region's overall small share (circa 2% of gross regional primary energy consumption) of renewable energy. Similarly, nuclear power has not yet made inroads into the region – with the exception of Iran's nuclear programme

Renewable energy, alongside energy efficiency has gained significantly in appeal in the region, in particular in response to the parallel fall in renewable energy technology costs relative to fossil fuels. Ambitions for renewables differ across countries, as do market size and readiness, but the overall picture presented is one of a region increasingly appreciating the role renewable energy could play.

Renewable energy options such as wind and solar energy, overlooked for decades owing to missing commercial incentives, could offer the region a valuable energy alternative to fossil fuels in power generation. This could save MENA economies not only rising import costs for oil in electricity use, but also free crude oil resources for export. The MENA region's climatic advantages (particularly in solar energy), together with its high level of reliance on oil for power generation, may indeed render some renewable energy technologies cost-competitive to conventional fossil fuels, provided the opportunity cost of alternative fuels is taken into account.

Plans and targets for the development of renewable energy are gradually being implemented in policies and projects, particularly in the GCC's biggest energy markets, Saudi Arabia and the UAE. Deployment in other GCC countries and the broader MENA region has progressed more slowly. At the end of 2017, the region (GCC) had some 146 GW of installed power capacity, of which renewable energy accounted for less than 1% (867 megawatts, MW). The UAE accounted for 68% of the total installed capacity in 2018, followed by Saudi Arabia (16%) and Kuwait (9%). Although this is far from the capacity planned, it does represent roughly a four-fold increase from 2014.

## 2. Fossil fuel use in the Middle East and North Africa

The Middle East and North Africa (MENA) region, for most of its recent history, has been known for its energy wealth. Home to more than half of the world's crude oil and a third of its natural gas reserves, the region has emerged as a global energy supplier (Menichetti et al., 2018).

Estimates suggest that the region accounted for 16% of the world's total energy production in 2014 (half of which was exported). Energy production increased by 2.4% annually on average between 1990 and 2014 and the region accounted for 37% of crude oil production and 22% of gas supply globally in 2016 (Menichetti, El Gharras, & Karbuz, 2017: 21).

The MENA region is, however, significantly diverse, not only in terms of economic and political structures, but also in terms of energy resource and infrastructure. Whilst an array of countries can be included under the MENA label, those countries and territories that most commonly constitute MENA are: Algeria, Bahrain, Egypt, Iran, Iraq, Israel Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, Turkey, United Arab Emirates and Yemen. Countries in the region can further be classified into two main types (Al Shamali et al., 2019: 5). This classification has important ramifications for both the use of fossil fuels and possibilities for transition to renewables.

- **Net energy exporters** (Gulf Cooperation Council Countries (GCC)<sup>1</sup> as well as Iran, Iraq, Algeria and Libya), which have large oil/gas resources;
- **Net energy importers** (all countries on the southern and eastern coast of Mediterranean except Algeria and Libya), which depend on energy imports.

Of these two categories, the GCC is the world's most important oil-producing region, holding about 30% of proven crude oil reserves and about 22% of global gas reserves (IRENA, 2019: 25). Saudi Arabia, with current oil reserves of some 266 billion barrels, ranks second in the world after Venezuela and could produce, at current rates, for at least another 60 years. Saudi Arabia also holds the world's sixth-largest natural gas reserves, the second-largest in the region behind

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<sup>1</sup> Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman.

Qatar, whose estimated proven gas reserves are about 24.9 billion cubic metres which make it the world's third largest holder of reserves after Russia and Iran (IRENA, 2019: 25).

More broadly, the MENA countries depend heavily on fossil fuels for energy supply and domestic consumption (Menichetti et al., 2018). The region's countries are rapidly growing energy consumers, a product of the growth in gross domestic product (GDP), population, and the pressures of urbanisation. It is estimated that energy demands could increase by more than 5% per annum in the future (Menichetti, El Gharras, & Karbuz, 2017: 2). The economies and populations of GCC countries in particular, have grown steadily in recent years, with much of the region's wealth and socio-economic development tied closely to oil and gas resources (IRENA, 2019).

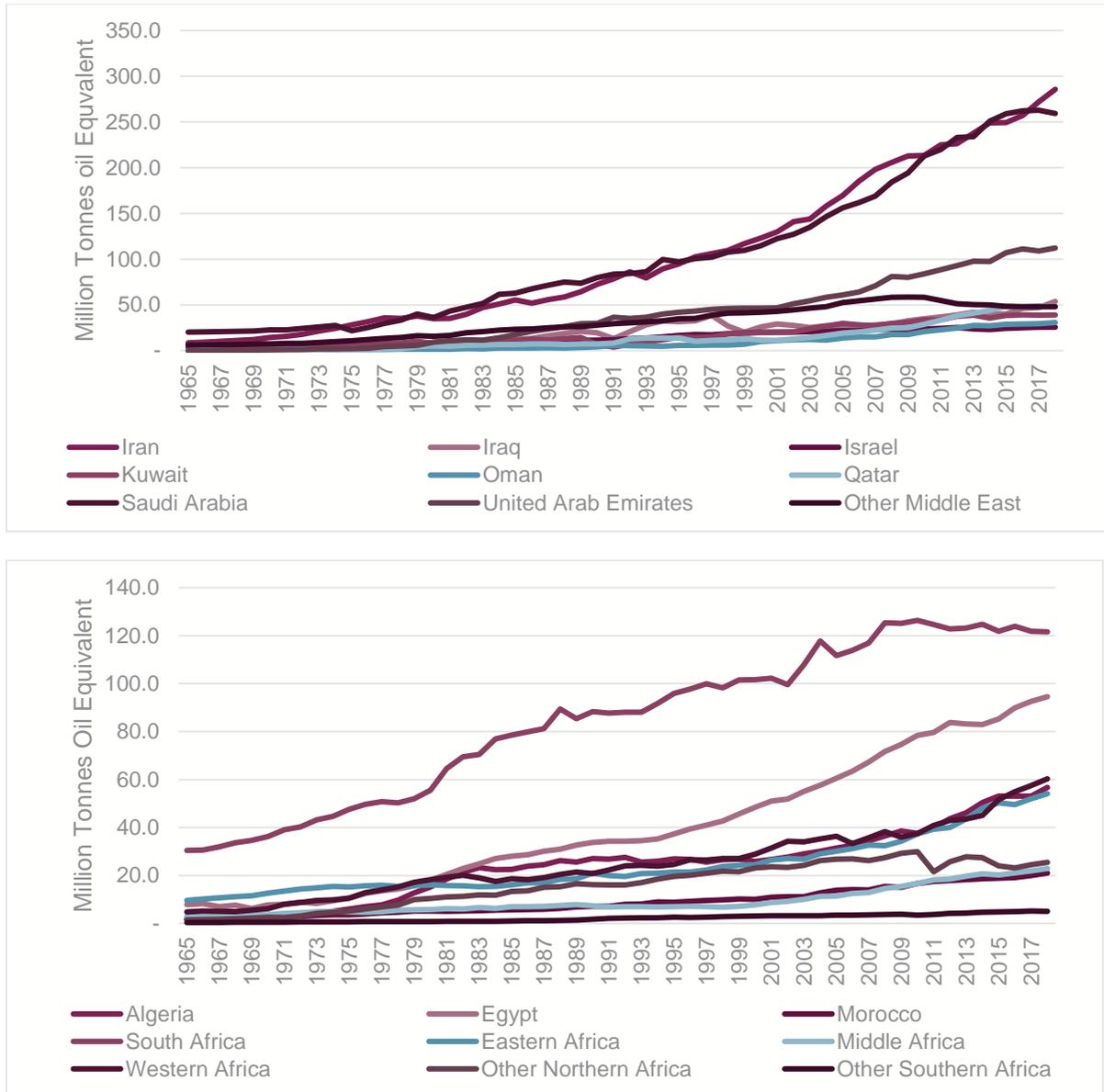
- **GDP Growth:** The World Bank expects economic growth in the MENA to continue at a modest pace of about 1.5 to 3.5% during 2019-2021, with some laggards and a few emerging growth stars. Growth in the MENA region was projected to rebound to an average of 2% in 2018, up from an average 1.4% in 2017. The modest rebound in growth is driven mostly by a rise in oil prices, which benefitted the region's oil exporters while putting pressure on the budgets of oil importers (World Bank, 2019).
- **Population Growth:** By 2050 the Middle East and Africa (not just North Africa) will be home to around 3.4 billion people – this is likely to be more than the populations of China and India combined. Such an unprecedented boom will present challenges as well as opportunities. A number of MENA countries are reported to have some of the fastest growing populations globally – Qatar 6.65%, Oman 6.45%, Lebanon 5.99%, Kuwait 5.44% and Jordan 4.86% (WEF, 2018).
- **Urbanisation:** An estimated 62% of the total population of the MENA live in cities. The MENA urban population is expected to double by 2040 which will create important economic opportunities but will also be accompanied by significant challenges in terms of appropriate planning and management of urbanisation (CMI, ND).

Estimates suggest that in 1971 fossil fuel energy consumption represented 95.08% of total regional, energy consumption, this peaked in 2008 at 98.71%. As of 2015 fossil fuel energy consumption represented 97.38% of total (World Bank Data)

**See: Figure 1: Fossil Fuel Energy Consumption (% of total), source: World Bank Data,**  
<https://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS>

According to (Al Shamali et al., 2019: 2), this situation of increasing demand across the MENA region is likely to increase stress on fossil fuel usage, cause net energy exporters to use their fuel supplies inefficiently, and ultimately strain government finances. On the other hand, it has challenged net energy importers to face the reality of volatile energy prices that threaten their energy security, potentially providing an opportunity to facilitate the partial transition to renewable energy sources (Al Shamali et al., 2019).

**See Figure 2 and 3: Primary energy<sup>2</sup>: Consumption (Million Tonnes Oil Equivalent) – Middle East (top) and Africa (bottom) 1965-2018**



Source: Author's own. Data taken from BP Statistical Review of World Energy, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx>

<sup>2</sup> Primary energy (PE) is an energy form found in nature that has not been subjected to any human engineered conversion process. It is energy contained in raw fuels, and other forms of energy received as input to a system. Primary energy can be non-renewable or renewable.

**Table 1: Primary Energy Consumption Growth rate per annum (%) 2007-2017**

Iran	Iraq	Israel	Kuwait	Oman	Qatar	Saudi Arabia	UAE	Algeria	Egypt	Morocco
3.2%	5.3%	1.1%	3.5%	7.0%	8.2%	4.5%	4.4%	4.5%	3.2%	3.7%

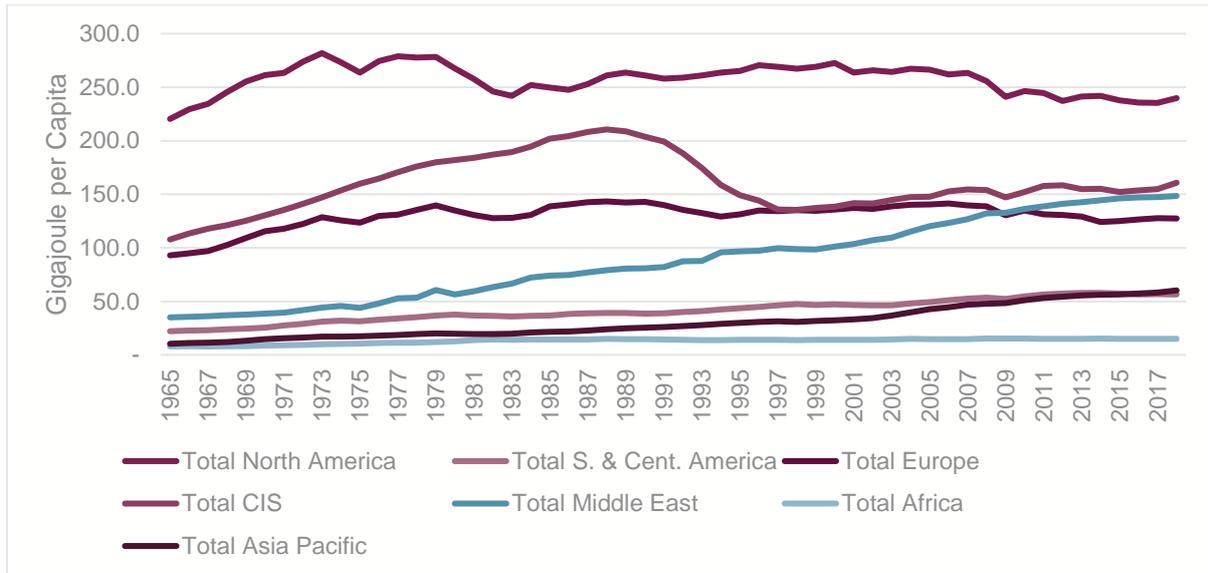
Source: Author's own, data taken from BP Statistical Review of World Energy, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx>

The MENA region's domestic energy market has historically been seen as marginal in the global picture, supplied with available, regionally produced, low cost fossil fuels (Al Shamali et al., 2019). With some of the world's lowest domestic prices for both primary energy and electricity, the MENA region has been viewed as lacking the kind of economic incentives needed for alternative energy sources, such as renewable energy and nuclear power, to enter its markets (Menichetti et al., 2019). The energy mix in MENA countries relies heavily on fossil fuels, particularly oil (45%) and natural gas (47%), with a minor share belonging to coal (5%) (Menichetti, El Gharras, & Karbuz, 2017: 6).

**See Table 2: Primary Energy: Consumption by Fuel (Million tonnes oil equivalent), Source: BP Statistical Review of World Energy, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx>**

Total energy consumption has grown across the MENA region. In the GCC it has doubled since 2000 and almost quadrupled since 1990 (IRENA, 2019: 39). The GCC is the fastest-growing energy market in the world, outpacing emerging economies in Asia and as such, the region is no longer a marginal consumer. Saudi Arabia, which accounts for over half of GCC final energy demand, is the world's fifth-largest consumer of oil (BP, 2019). Energy demand has also expanded on a per-capita basis: Bahrain, Kuwait, Oman and the UAE show levels far above those of most other industrialised countries, including China, India, Japan, the Russian Federation and the United States, while Qatar has the world's highest rate of energy demand on a per capita basis.

**Figure 4: Primary energy: Consumption per capita (Gigajoule per capita)**



Source: Author's own, data taken from BP Statistical Review of World Energy, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx>

GCC countries in particular are experiencing significant growth in demand for electricity. Peak electricity load in Saudi Arabia in 2015 was 10% higher than in 2014; the 2020 level is expected to be nearly a third greater than that of 2014. By 2032, it will have doubled (MEES, 2016: np). As demand rises, the need for new power sector infrastructure grows. In Qatar, rising demand for power in remote settings requires significant upgrades and extensions in the grid (Zarzour, 2018). Saudi Arabia was projected to require additional investment in the power sector of at least 500 billion Saudi Riyals (SAR) (USD 133.3 billion) until the mid-2020s in order to safeguard supply (MEES, 2016). Slower economic growth may reduce this number.

## The centrality of fossil fuels to the economies of MENA countries

The GCC accounts for circa 25% of global crude oil production, mostly from Saudi Arabia, the UAE and Kuwait, with these countries among the world's ten-largest crude oil producers in 2017. The GCC is also home to most of the world's spare production capacity (IRENA, 2019). Historically, most of the GCC states' oil production has been exported, owing to high reserves and comparably small domestic consumption. Although the region's domestic energy demand has risen tremendously in recent years, the GCC is the source of just under a third of the crude oil supplied to the international market and accounts for more than two-thirds of the Middle East region's exports of crude oil. More than half of the GCC exports come from Saudi Arabia, although the country, together with Kuwait, still use crude oil and oil products for power generation, as natural gas supplies have lagged behind growth in peak demand (S&P Global Platts, 2018).

The perceived abundance of low-cost energy supplied by fossil fuels has, in part, fuelled the region's domestic energy demand growth, having spurred both extensive energy-intensive industrialisation programmes and the rapid rise in living standards experienced by some of the region's oil exporters – in particular the economies of the GCC (EI-Katiri, 2014). Forecast to stand alongside Asia in accounting for the majority of incremental global primary energy demand

growth well into the 2030s, the MENA region is a rapidly growing energy consumer (El-Katiri, 2014). Rising prices for oil on world markets since the early 2000s have raised the cost of imported oil and oil products for MENA net energy importing countries, while many oil and gas producers (net energy exporting countries) divert growing shares of oil and natural gas production away from international markets, to supply domestic demand (El-Katiri, 2014: 1).

GCC countries are also a large and rapidly growing producer of petroleum products other than crude oil – among them gasoline, liquid petroleum gas (LPG), propylene, naphtha (a key source of feedstock in petrochemical production), diesel and fuel oil, kerosene, and jet fuel (El-Katiri, 2014). Estimates suggest that the increase in energy-related greenhouse gas (GHG) emissions in the region will be substantially worse – 47% by 2035 as compared to 2010 in the Middle East alone (Jalilvand, 2012: 2).

El-Katiri (2014) asserts that this situation underscores the need for suitable energy strategies and effective policies for sustainable energy development in the region. The MENA region has untapped potential for exploiting renewable energy. Estimates suggest that only a small amount of the regions primary energy mix is provided by renewable energy (circa 1%) according to Jalilvand, (2012: 2).

## **The MENA region’s changing energy landscape**

Renewable energy, although a recent entrant to the MENA energy landscape, has the potential to cut fuel costs, reduce carbon emissions, conserve water and create jobs. GCC countries in particular have taken steps seek to diversify their economies, against the backdrop of fast-growing domestic energy demand and a desire to safeguard hydrocarbon export revenues for the future (IRENA, 2019).

The MENA region’s domestic energy landscape has change significantly in recent years with El-Katiri (2014: 2) suggesting that two main factors that have played a significant role in shifting regional energy priorities:

- (i) the surge in regional energy demand across MENA economies, and its implication on the export capacity of the region’s producing countries;
- (ii) the rising economic cost of surging domestic energy demand in both net energy exporting countries and net energy importing countries as a result of rising oil prices since the early 2000s and the region’s continued reliance on oil for a large share of its domestic energy supply.

A third, related aspect, one whose economic weight is less easily quantifiable is:

- (iii) the environmental consequences of continued use of fossil fuels for virtually all of the region’s energy needs.

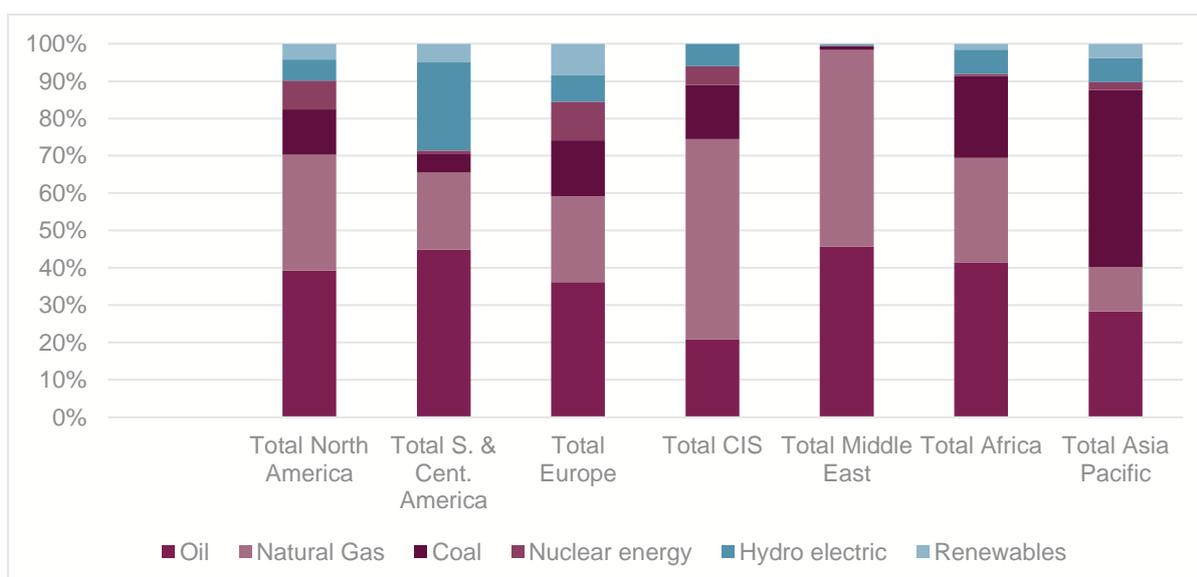
The MENA region has historically been a peripheral demand market for energy; the consequence of its historically low levels of industrialisation, small population and limited size of its domestic market (El-Katiri, 2014: 3). However, the MENA economies’ energy consumption has grown faster than most other regions’ demand, particularly during the 1970s (a decade of vast energy-intensive expansion in the region’s oil producers in particular). Regional energy demand has continued to grow, although decelerating to its current level (circa 2%) more recently (El-Katiri, 2014). Many large oil-producing countries, particularly GCC, have grown faster than the regional average, both in absolute and in per capita terms. Aggregate Gulf demand,

(including the GCC economies, Iran, and Iraq) for primary energy has risen five-fold since the 1980s, translating into the world's fastest energy demand growth for any region if disaggregated from overall MENA demand (El-Katiri, 2014: 3).

The region's energy needs are forecast to continue to grow – driven by continued industrialisation, urbanisation and rising living standards. OECD statistics suggest MENA aggregate energy demand will expand well above the world average, at circa 3% per year 2010-2030, with electricity demand growing at a rate of circa 6% a year during this period (OECD, 2013: 10).

Despite increased demand and a slowly changing energy mix – fossil fuels continue to supply the majority of the MENA region's primary energy needs, around 98% of the region's energy mix. Other than oil and natural gas, only coal has an additional market share, albeit restricted to Morocco and Israel; while hydro-power accounts for the majority of the region's overall small share (circa 2% of gross regional primary energy consumption) of renewable energy. Similarly, nuclear power has not yet made inroads into the region – with the exception of Iran's nuclear programme (El-Katiri, 2014).

**Figure 5: Primary Energy: Consumption by fuel in 2018**



Source: Author's own, data taken from BP Statistical Review of World Energy, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx>

### Challenges, Concerns, Opportunities

The economic and political structures of MENA countries are intimately tied to the continued availability of fossil fuels at low prices. However, the energy environment is changing, with the availability of fossil fuels no longer as assured as previously, and with fuel prices rising above their historically relatively low levels. In recent years, concerns about the security of supply have come to the fore.

The impact of falling oil prices in 2014-2015 and a generally lower oil-price environment since then have been felt across the GCC economies. Most countries have undergone substantial fiscal consolidation since 2014, primarily by cutting spending (IRENA, 2019: 22). Countries such

as Saudi Arabia and the UAE, have also reduced subsidies on fuel and electricity and set tariffs closer to market prices (IMF, 2017).

Producing countries have also seen interruptions to supply as a result of civil conflict (Libya), flat-lining production (Egypt) and the long-term decline of resources (Tunisia). This has had an impact on net importing countries where the supply provided by traditional partners has fallen below historic levels and is no longer sufficient to meet demand (Bridle et al., 2014). For these countries, reliance on favourable long-term contracts with a few key suppliers is a source of vulnerability.

Security of supply concerns have a cost dimension for net importers, as short-term interruptions have caused recourse to international markets at a high cost to national budgets. Over the longer term, expiration of long-term supply contracts with regional partners can be expected to lead to higher import costs (Bridle et al., 2014: 15).

In this environment, renewable energy has been heralded as representing a potential opportunity (Bridle et al., 2014). It is seen to offer the chance to diversify energy supply away from fossil fuels, and minimise the impacts of supply interruptions. It also offers revenue benefits to both groups of countries: exporting countries can increase earnings through reducing the portion of production serving domestic demand and increasing the proportion going to export while importing countries can reduce expenditure on fossil-fuel imports and the volatility associated with this expenditure.

### ***Fossil-Fuel Subsidies***

A driver of fossil fuel use is the prevalence of subsidies which are common across the region, but have become increasingly burdensome with rising fuel prices (Bridle et al., 2014: 15).

- “For countries without large domestic resources, this cost has particular acuity, since increasing international prices widen the gap between the price paid for imports and the price charged to consumers.
- In producing countries, the opportunity cost of keeping prices below international levels is a constrained national budget. Impacts are exacerbated by low prices leading to the over-consumption of fossil fuels”.

The impact of fossil-fuel subsidies is also felt in the structure of the energy sector. Favourable climatic conditions mean that renewable energy is often at cost parity with fossil-fuel power generation and may be cheaper in some instances (Bridle et al., 2014). This advantage is obscured by fossil-fuel subsidies. While other factors such as the political acceptability of renewable energy and the constraints of existing infrastructure to support increased renewable-energy generation may be important, the distortions in relative costs explain why deployment of renewable energy in the region has been below its potential.

As noted, when oil prices dropped in 2014, a number of importing countries stalled or suspended reforms. It is conceivable that, if oil prices increased again, some exporting countries would do the same. Energy pricing reform may currently be a trend, but that is mostly due to the strong oil price volatility. Sustaining energy price reforms will depend on the success of pricing and other reforms, measured not only in fiscal consolidation, but also in tangible economic opportunities and new, better-targeted social safety nets. This is particularly the case for exporting countries (IISD, 2018: 20).

### ***Fossil Fuel Net Importers***

Net energy importers are reliant on a continuous supply of fossil fuels to meet energy needs. The stability of this supply is affected by a range of internal and external factors, which lead to fuel insecurity and vulnerability in importer countries (Al Shamali, 2019). Countries that import most of their energy are particularly exposed to currency fluctuations and volatile fuel prices (Van de Graaf & Bond, 2019: 36). Decisions are often made for the sake of supply continuity, which might jeopardise energy security. Even when fossil fuels prices are stable, they still account for huge costs that impact many sectors. These costs represent a burden on the economy, as they affect both citizens and the private sector and slow economic growth.

Transitioning to domestically generated renewable energy may help such countries achieve energy security, increases economic benefits, and creates more jobs. It is estimated that an additional estimated 14 million jobs will be created in the renewable energy sector globally by 2050 (IRENA, 2019: 53). Countries adopting this transition may be able to improve their trade balance (Van de Graaf & Bond, 2019: 38), as well as avoid supply disruption and decrease security threats.

### ***Fossil Fuel Net Exporters***

As major oil and gas exporters, resource-rich countries in the MENA region, e.g. Saudi Arabia, UAE, Iraq, Kuwait, are economically dependent on the oil and gas trade. Major natural gas exporters, like Qatar and Algeria are also dependent on such trade, with resource wealth a significant part of their GDP. In response, to the oil price collapse in 2014-2016 countries like the UAE started to reform/diversify their economy to become less reliant on oil exports (Al Shamali, 2019: 7).

In 2014, the collapse in oil prices incentivised governments to reform energy subsidies, especially in oil-exporting countries, where energy subsidies represented nearly 6% of GDP before the oil price collapse (World Bank, 2018: 7). During this period, a majority of oil exporters introduced subsidy reforms and started to reduce utility subsidies (World Bank, 2018: 7). The depletion of oil reserves also represents a challenge to these economies, especially in countries like Bahrain or Oman (Al Shamali, 2019).

While the oil and gas sectors remain major contributors to the GCC economies GDP, economic policy in these countries places increasing emphasis on diversification (IRENA, 2109: 23):

- to reduce risks associated with dependence on oil revenues (e.g., fluctuating oil prices and changes in global oil-market dynamics).
- to create jobs, particularly high-value jobs for nationals, by establishing a more varied range of business sectors and industries, and opening up more opportunities for the private sector.
- to plan for the post-oil era, when demand for fossil fuels is expected to subside.

## **3. Transition to renewable energy**

The MENA economies have historically been small energy consumers compared with Asia, Europe, and North America. However, rapid economic growth, energy-intensive industrial expansion, growing populations, high incomes and high living standards (primarily in GCC

countries) have gradually altered the perception of a natural abundance of hydrocarbon resources relative to the region's needs (IRENA, 2019). The growth in domestic energy consumption across all sectors, has challenged policy makers to meet demand economically, without compromising current and future hydrocarbon export revenues, while also managing their countries' carbon footprint. Renewable energy, alongside energy efficiency has gained significantly in appeal in the region, in particular in response to the parallel fall in renewable energy technology costs relative to fossil fuels (IRENA, 38). Ambitions for renewables differ across countries, as do market size and readiness, but the overall picture presented is one of a region increasingly appreciating the role renewable energy could play.

El Katiri (2014) argues that renewable energy options such as wind and solar energy, overlooked for decades owing to missing commercial incentives, could offer the region a valuable energy alternative to fossil fuels in power generation. She continues that this would save MENA economies not only rising import costs for oil in electricity use, but also free crude oil resources for export by the region's hydrocarbon producers.

The MENA region's climatic advantages (particularly in solar energy), together with its high level of reliance on oil for power generation, may indeed render some renewable energy technologies cost-competitive to conventional fossil fuels, provided the opportunity cost of alternative fuels is taken into account (El Katiri, 2014). El Katiri (2014: 1) continues that the case is stronger for renewables substituting for oil than for natural gas, although the price advantage of renewables over gas rises along with a higher share of non-pipeline gas imports.

Plans and targets for the development of renewable energy are gradually being implemented in policies and projects, particularly in the GCC's biggest energy markets, Saudi Arabia and the UAE (IRENA, 2019). Deployment in other GCC countries and the broader MENA region has progressed more slowly. At the end of 2017, the region (GCC) had some 146 GW of installed power capacity, of which renewable energy accounted for less than 1% (867 megawatts, MW). The UAE accounted for 68% of the total installed capacity in 2018, followed by Saudi Arabia (16%) and Kuwait (9%). Although this is far from the capacity planned, it does represent roughly a four-fold increase from 2014 (IRENA, 2019: 14).

**Table 3: Installed renewable energy capacity as of the end of 2018<sup>3</sup>**

	2017-2018						2016	2015	2014
Country	PV	CSP	Wind	Biomass and Waste	Total RE (in MW)	Share of RE in total electricity capacity	Total RE	Total RE	Total RE
Bahrain	5	0	1	0	6	0.1%	6	6	6
Kuwait	19	50	10	0	79	0.4%	20	1	0

<sup>3</sup> Note: 2018 data are available only for Kuwait and the UAE. Oman's 7 MWth solar enhanced oil recovery plant and the newly finished first phase of 1 GWth Miraah Solar EOR is not included because this table addresses only electricity. PV = photovoltaic; CSP = concentrated solar power; RE = renewable energy. Totals may not add up due to rounding.

<b>Oman</b>	8	0	0	0	8	0.1%	2	2	1
<b>Qatar</b>	5	0	0	38	43	0.4%	43	42	42
<b>Saudi Arabia</b>	89	50	3	0	142	0.2%	74	74	24
<b>UAE</b>	487	100	1	1	589	2.0%	144	137	137
<b>Total</b>	613	200	14	39	867	0.6%	289	262	210

Source: IRENA (2019: 14), 'Renewable Energy Market Analysis: GCC 2019', [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA\\_Market\\_Analysis\\_GCC\\_2019.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Market_Analysis_GCC_2019.pdf)

Installed capacity is dominated by a handful of utility-scale solar projects. Solar PV (photovoltaic) and CSP (concentrated solar power) together, provide 94% of installed capacity presently and almost 91% of the project pipeline. The CSP capacity is currently located in the UAE, Kuwait and Saudi Arabia. Qatar hosts virtually all of the region's commercial-range waste-to-energy power generation capacity, while most of the limited deployment of wind power is located in Kuwait. Plans for the expansion of wind power, in particular in Saudi Arabia and Oman, should raise wind capacity in the GCC over the coming decade (IRENA, 2019: 15).

Because the region has only recently become a market for renewable energy, most declared targets are not yet enshrined in legislation. The UAE and several other GCC countries have incorporated their renewable energy targets into their Nationally Determined Contributions under the United Nations Framework Convention on Climate Change (UNFCCC) (IRENA, 2019). Targets also figure in official state visions and announcements from high-ranking members of government. Deployment in many GCC and MENA region members remains limited to pilot and demonstration projects. Nevertheless, as more projects come online and confirm the cost-effectiveness of renewable energy, prospects for an accelerated take-up are positive.

## Barriers to Renewables Deployment in the MENA

The political economy of energy in MENA is characterised by a set of unique regional factors (El Katiri, 2014)

- the availability of large supplies in conventional oil and gas resources;
- the pivotal role played by hydrocarbon wealth in many MENA oil and gas producers' economic development since the 1960s and 1970s;
- the particular social contract in many MENA countries where energy has, for many decades, been considered a public good to be provided by governments, if not for free, then at prices that have in many cases been merely a fraction of their price in any other international market for most of these countries' modern histories.

An important part of the wider picture of low electricity prices is hence the price of conventional fuels – such as diesel, fuel oil, and crude oil. Crude oil is used by a number of oil producers to compensate for insufficient gas supplies during peak demand in summer, and natural gas is supplied to domestic industries such as power generation. The MENA region as a whole continues to subsidise and under-price domestically supplied fossil fuels to an extent that will

render alternative renewable energy sources uncompetitive on a cost basis even where genuine economic value would be generated, for instance via saved imports or the availability of more oil and natural gas for exports (El Katiri, 2014: 11).

## Promoting Renewables in the MENA Region

IRENA (2019) report that despite challenging contest, the GCC is set to see a major acceleration in renewable energy deployment. Led by the UAE, Oman and Kuwait, a total of nearly 7 GW in renewable power generation capacity is planned to come online by the early 2020s (IRENA, 2019: 51). Solar PV remains the dominant technology in the region's project pipeline, with a share of over three-fourths, followed by CSP (around 10%, all of which accounted for by a single project in the UAE) and a 9% share for wind projects, primarily in Saudi Arabia and Oman. Solar-assisted enhanced oil recovery in Oman is also expected to contribute about 1 gigawatt-thermal (GWth) in 2019 (IRENA, 109: 15). A large portion of the region's demand for renewable energy can be expected to come from its largest energy markets, mainly UAE, where the market for renewables is most mature, and Saudi Arabia, where a changing policy focus is assigning greater priority to renewables. Among the other GCC markets, Oman, in particular, has demonstrated interest in solar and wind energy as alternatives to domestic gas supply. Oman and Saudi Arabia also demonstrate that wind resources, both onshore and offshore, could complement the load profile of solar power.

The market for distributed generation will likely grow. Up to now most renewable energy projects in the GCC have been of utility scale, mainly devised through central planning and implemented by independent power producers. Distributed (or decentralised) generation of electricity is expected to play a growing role in the future (IRENA, 2019: 19). Its growth will be linked to further reform of utility tariffs and incentive schemes for self-generators, as well as long-term policies to liberalise regional electricity market structures (IRENA, 2019).

In order to harness the potential of renewable energy, electricity systems will need to accommodate more variable energy. Both solar and wind are intermittent sources of power, and electricity systems will have to be modified to accommodate them, particularly in those GCC countries planning significant additions of renewables relative to the size of their national electricity systems, such as Oman, the UAE, and Saudi Arabia (IRENA, 2019). A range of technology solutions is available to support the necessary changes, including electricity storage, demand-side management, efficiency measures and electricity trading.

In order to promote renewable deployment across the MENA region, Poudineh et al (2016: 24-30) advocate for the removal of certain barriers to deployment.

**Grid connection and management:** a key component of energy transformation in the economies of MENA region is the availability of grid infrastructure that enables electricity transmission from production to consumption areas. The lack of a national grid and/or inadequate network infrastructure can pose a threat to the development of renewables. In the absence of adequate grid capacity and resiliency, renewable energies may face frequent curtailment due to network and reliability constraints.

In a highly integrated market, where the same actor handles generation and transmission, incentives might arise to exclude generating competitors by denying grid access. Grid investment requires a suitable and stable regulatory and policy environment with appropriate incentives and

long-term horizons. Algeria and Jordan currently include the most preferential grid access conditions for renewable projects.

**Institutional challenges:** the implementation of renewable policy depends on the existence of necessary institutional capacity, including administrative, economic and political. The exact type of institutions required depends on the specific policy and its complexity. The enhancement of institutional capacity must not lead to excessive administrative and regulatory burdens as they themselves can become impediments to renewable deployment. Effective institutions need to reduce the administrative burden of procurement, selection of contract holders, granting contracts, site selection, construction and environmental permits and grid access to the minimum. While dedicated renewable energy agencies or departments are necessary to enable coordination amongst stakeholders, independent regulators are critical to ensuring transparency and engendering stability in the implementation of policies.

**Risks and uncertainties:** The economic environment of industries always contains risks and uncertainty and renewable energy. Renewable energy investors face risks including political risk, policy and regulatory risks, technology risk, currency and liquidity risk and power off-taker risk. These risks and uncertainties affect the path of technological evolution and demand for renewable energy, but also the cost of capital and ability to finance projects. Risk and uncertainties are barriers for scaling up renewable deployment and addressing them requires access to effective risk mitigation instruments.

- Political risks are related to the political events that have a negative impact on the value of investment including war, civil disturbance, sabotage, expropriation and non-honouring of contracts.
- Policy and regulatory risks are those risks that are related to changes in investment incentives (for example, removal of renewable subsidies), network codes, grid connection costs model, and permitting processes among others.

In resource-rich MENA countries, renewable investors face uncertainty both where there is no specific renewable policy as well as after policy incentives are designed and implemented. Developers also face technology risk, which is related to nascent renewable technologies and inexperienced and unskilled workers operating the facilities. The local workforce may lack the skills needed to operate and maintain the power system.

Despite the renewable energy potential in resource-rich MENA countries, their share of renewables in electricity generation is among the lowest in the world, lagging behind similar high-income economies, but also low-income economies. Although in recent years most MENA countries have announced renewables targets, these have extremely ambitious timeframes and face significant challenges given current high levels of hydrocarbon resource-dependency.

## 4. Recommendations from the literature for consideration/discussion

Throughout the literature a number of recommendations are made on how to support MENA countries deploy renewable energy and reduce dependency on fossil fuels. These are included for DFID to discuss internally and no assessment is made to the validity of these recommendations:

**IRENA (2019). Renewable Energy Market Analysis. IRENA. [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA\\_Market\\_Analysis\\_GCC\\_2019.pdf](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Market_Analysis_GCC_2019.pdf)**

- Implement subsidy reforms to move towards a gradual fossil fuels phase-out, with consideration to current socioeconomic limitations and climate change impact.
- Deploy more local renewable energy (RE) resources according to each MENA country's respective needs, including photovoltaics (PV) installations, concentrating solar power (CSP) and wind turbines, in the following ways:
  - Adopt policy reform measures for small-to-medium-scale RE projects allowing households and commercial consumers to install RE systems.
  - Provide a safe investment environment for investors, while also customising policies according to project scale and technology type.
  - Finance RE projects through international and local financial institutions, like the World Bank and local banks. The involvement of these institutions would engender long-term sustainable developments.
  - Manufacture RE technology components locally, including, but not limited to, PV panels, inverters, wind turbines, CSP mirrors and cables, all of which will create jobs and promote economic growth.
  - Encourage small-to-medium-scale RE projects and decentralized electricity generation through incentives, tax exemptions, and public awareness campaigns, similar to the model adopted by Jordan.
- Decouple fossil fuels from the economic growth model through:
- Horizontal diversification through investing in other sectors (e.g. agriculture, tourism, and industry depending on each country's local resources), reinforcing these sectors with RE, and incorporating special incentives.
- Vertical diversification through including refined products in net exporters' hydrocarbon exports.
- Develop a clear plan for energy transition, including specific time frames depending on the country's current political and economic context. This plan should incorporate all stakeholders and civil society members along with clear government engagement.
- Establish better regional cooperation between net exporters and net importers to achieve regional energy security. This can be reinforced by creating a MENA energy trade market, with consideration to compatibility between energy supplies and demand profiles.

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## About this report

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