the MENARA **booklet** for
The Private Sector

Jordi **Quero** & Cristina **Sala** (Eds.)

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Cleaning solar panels. Ain Beni Mathar Integrated Combined Cycle Thermo-Solar Power Plant.
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The *MENARA Booklets* are a series of publications, created under the MENARA Project framework, which provide insights on the Middle East and North Africa regional order. These Booklets translate scholarly-sounded research into helpful insights for practitioners, including humanitarian agencies; development agencies and NGOs; the private sector; and academia. In each of the four Booklets you may find a compendium of articles and extracts covering the most pressing issues for your field of expertise.

The *MENARA Booklet for the Private Sector* provides you state-of-the-art and thoughtful analysis which may help your organization to better address challenges and inform your daily decisions. It includes our researchers' main ideas on topics like digitalization and technological transformations in the region; its embeddedness in economic globalization; shifts and prospects of the energy market; and future economic challenges associated with climate change. All these, read together, would offer a comprehensive picture of the most critical elements affecting regional markets.

Under the framework of the MENARA Project, fourteen research institutions have been carrying out fieldwork in the last three years to improve our understanding of the Middle East and North Africa amid a shifting context. It has studied the geopolitical order in the making, identified the driving forces behind it, shed light on bottom-up dynamics and assessed the implications of these processes on the EU and its policies towards the region. All in all, analysis and ideas from fact-finding missions, interviews, stakeholders meetings and focus groups come together to offer you a valuable outcome.

The extracts presented in this compilation have been modified and adapted by the editors. For the sake of accessibility, we have rid every bibliographic reference and footnote included in the original versions of the articles. For those interested in them, please check the full original versions at **www.menaraproject.eu**. Some other minor editing changes have been introduced to make the document fully coherent (such as changes in names and number of sections and subsections or the elimination of some graphs and infographics). We have tried to respect each author's contributions, trying to be as less intrusive as possible.

We hope that The *MENARA Booklet for the Private Sector* is useful and enjoyable for you.

The editors

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The MENA region in the global energy markets

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The current paper aims to determine whether the MENA region is peripheral to or embedded in current global energy dynamics. To do so, it looks at current trends at the global level before focusing on the regional situation. The role of key energy actors and the implications for the MENA countries are also discussed. To address the main issues and isolate key hotspots, the following research questions are explored: (1) How will global energy trends impact the region – and vice versa? (2) What role will the region play in the future, especially in oil and natural gas markets? How will it be affected by the increasing share of shale oil and gas among the energy market commodities, as well as the evolution of the liquefied natural gas (LNG) trade? How will growth in the electric car market impact oil demand? (3) What is likely to be the impact of shrinking export levels and decreasing oil prices on state revenues and policies in the future? (4) How can renewable energy sources help MENA countries retain their leadership position in global energy markets?

GLOBAL ENERGY TRENDS AND DYNAMICS

The role of the USA in global energy markets has gradually increased, especially in the light of recent discoveries of shale gas, making it a major contributor to world energy supply. The country hosts 2.8 per cent of the world's proved oil reserves and 4.7 per cent of natural gas reserves. In particular, US tight oil output witnessed a rise of 8 million barrels per day (mb/d) from 2010 to 2015, whereas gas production reached 749.2 billion cubic metres (bcm) in 2016. Shale gas will account for the largest rise in gas production, an increase of 630 bcm between 2008 and 2023, which has fuelled investments in petrochemicals and other energy-intensive industries in the country. These dynamics are more likely to challenge incumbent suppliers, as the USA will become the world's largest LNG exporter by mid-2020 and a net exporter of oil, especially light crude and (a few years later) refined products, yet it will remain an important importer of heavy crude oil for its refineries.

EU countries are progressing towards a more sustainable energy mix. Energy demand decreased by 4 per cent in 2015 compared with 1990 levels, and the share of fossil fuels in the energy mix is declining due to the expansion of low-carbon technologies.

In India, energy demand increased by 178 per cent in 2015 compared with 1990 levels, accounting for 6 per cent of world primary energy demand. In the future, most of the global demand growth will come from India, which will have to be met through imports. More energy will be needed to meet its growing energy needs as its economy expands and its population increases. Currently (as of 2016) there are 239 million people in India who lack access to electricity.

China is by far the greatest energy consumer in the world. It has witnessed the largest energy demand increase of any country (241 per cent compared with 1990 levels), alone accounting for 22 per cent (2,973 million tonnes of oil equivalent, Mtoe) of world primary energy demand in 2015. China is gradually moving away from a heavily fossil fuels-based energy system (with fossil fuels currently accounting for 91 per cent of its energy supply). The year 2013 marked a major shift in China's energy system orientation as, for the first time, the largest share of new electric capacity additions came from wind, solar photovoltaics (PV) and hydropower. In terms of oil and natural gas demand, China's economy will absorb a quarter of the projected rise in global gas demand (with imports of 280 bcm in 2040), while the EU will come second. China will become the largest oil consumer (overtaking the USA by around 2030) in 2040 according to the IEA New policies Scenario, with imports reaching 13 mb/d (…).

RENEWABLES ARE LEADING THE DECARBONIZATION EFFORTS OF THE POWER SECTOR

Even though the share of renewables has remained constant in total primary energy demand, the impressive deployment growth dynamics of renewables can be clearly observed in the power sector. At the global level, renewable electric installed capacity increased by more than 8 per cent annually between 2010 and 2016, from 1,251 gigawatts (GW) in 2010 to 2,017 GW in 2016. By technology, wind and solar PV have been the main drivers for such growth. Together, wind and solar PV doubled their share in total renewable installed capacity from 19 per cent in 2010 to 40 per cent in 2016. The incremental installed capacity of wind and solar PV installed in 2016 matched, for the first time, that of coal and gas. Developing economies have taken the lead over developed countries in terms of investments in renewable energy technologies. In particular, China, India and Brazil accounted for over half of global investments in renewables (excluding large hydro) in 2017, with China alone accounting for 45 per cent (Frankfurt School-UNEP Centre/BNEF 2018: 20) (…).

REGIONAL ENERGY TRENDS: HIGHER ENERGY DEMAND GROWTH RATE THAN THE GLOBAL AVERAGE

Compared with global energy demand growth, the MENA region as a whole has doubled its share in world primary energy demand, from 4 per cent (370 Mtoe) in 1990 to 8 per cent (1,084 Mtoe) in 2015. By sub-region, most of the growth has been observed in the Gulf Cooperation Council (GCC) countries as well as in Iran. For instance, Qatar and Oman witnessed the fastest growth in energy demand, with annual average rates of 8.1 per cent and 7.4 per cent respectively during the 1990–2015 period. In 2015, two countries, Saudi Arabia and Iran, accounted for 42 per cent of total primary energy demand (TPED) in the region, followed by Turkey (12 per cent), Egypt (7 per cent) and Algeria (6 per cent), with the rest accounting for the remaining 23 per cent.

The rapid increase in energy demand, for electricity in particular, is arguably the most notable trend in the region. Whereas global electricity demand has been increasing by around 2.9 per cent on average annually, the increase was much larger in the MENA countries, at 6 per cent annually during the 1990–2015 period. In 2015, Saudi Arabia accounted for the largest share of electricity consumption, with 21.1 per cent (313 terawatt-hour, TWh) of total electricity consumption in the MENA region, followed by Iran with 16 per cent (236 TWh), Turkey with 14.6 per cent (215 TWh), Egypt with 11 per cent (160 TWh) and the UAE with 8.5 per cent (118 TWh). Significant compound annual growth rates (CAGR) in electricity demand were seen in Oman, Qatar and UAE, with 8.4 per cent, 9 per cent and 8.5 per cent respectively during the 1990–2015 period. Most of the other countries had rates above 5 per cent.

On a per capita basis, electricity consumption rates vary significantly across the region. Some countries in the region have the highest per capita rates in the world; for instance, Bahrain's consumption rate (20.1 megawatt-hour, MWh) is more than double the average rate for Organization for Economic Co-operation and Development (OECD) countries and six times higher than the world average. Qatar, Kuwait, UAE and Saudi Arabia also have consumption rates above the average for OECD countries. The demand for electricity in the region is expected to increase due mainly to economic development and population growth, combined with increasing needs for water desalination and air conditioning.

The increasing demand for energy is likely to have far-reaching implications for economies of the region. Some countries, including Saudi Arabia, Qatar, Kuwait and Iraq, export more than half of their energy production. However, these countries might see their export capacities shrink should the current energy demand trends be maintained. In GCC countries, for example, rising energy demand, driven by huge development projects in the

domestic, service and infrastructure sectors, as well as growth in industrial consumption, mainly in the steel, aluminium and petrochemical industries, is expected to put pressure on government budgets and reduce hydrocarbon export potential, thereby resulting in a loss of foreign exchange revenues.

REGIONAL ENERGY TRENDS: AN ENERGY SYSTEM STILL HEAVILY RELIANT ON FOSSIL FUELS THOUGH GRADUALLY INTEGRATING RENEWABLES

The energy mix in the MENA countries is heavily dependent on fossil fuels – natural gas (48 per cent), followed by oil (44 per cent) and then coal (5 per cent). Renewables accounted for the remaining 3 per cent in 2015. Oil has been the dominant energy source in the MENA region for a long time but its share in the energy mix has been shrinking, reaching 44 per cent in 2015. Natural gas has gained in importance across the region, surpassing oil as the primary source of energy and accounting for 48 per cent of total energy demand in 2015. It saw the fastest growth rates (6.8 per cent CAGR) during the 1990–2015 period, increasing from 102 Mtoe to 522 Mtoe. Natural gas accounts for the largest share of TPED in Bahrain, Qatar, Oman, UAE, Algeria, Egypt and Iran, and is particularly relevant for power generation. This upward trend is more likely to continue in the future, thanks to locally available sources and the abundant world supply of shale gas and LNG.

With the exception of Iran, nuclear energy is non-existent in the energy mix in the region, but the political decision to invest in nuclear energy remains an option for the future. The UAE and Turkey are advancing their nuclear programmes, with the Barakah and Mersin plants under development. Saudi Arabia, Egypt and Jordan also have plans to introduce nuclear power into their energy mix, while others (i.e., Algeria, Morocco and Tunisia) are in a more exploratory phase. The nuclear option has been advanced to address several challenges: meeting the rising demand for electricity, maintaining export levels to guarantee a sustained revenue stream, addressing energy security concerns and moving towards a low-carbon economy. The nuclear option seems to be perceived as offering other benefits as well, as it is seen as a contingency plan against Israel's and Iran's nuclear programmes. In particular, in 2008 the Arab League Secretary General Amr Moussa encouraged members of the League to start civil nuclear energy programmes as a way to counterbalance Israel's weight in the sector. Regardless of motivation, the nuclear option is gaining momentum and is likely to be adopted by some countries in the region. However, given the high up-front investment costs compared with other power generating technologies, the nuclear option might not be feasible in all countries, especially those with government funding constraints such as Egypt, Jordan

and Morocco, and even in oil rich states while oil prices remain below 50 US dollars per barrel, placing further pressure on public finances. Some of the above mentioned countries are turning to Russia and possibly China to finance their nuclear energy programmes, an issue with important geopolitical implications.

Despite their potential, the contribution of renewables to total primary energy demand is still minor, yet their role in the power sector is increasing. Renewables have been developed mostly in energy importing countries. Historically, hydropower (used for power generation) and biomass (traditional biomass, used in some countries for heating and cooking) have been the most dominant sources of renewable energy. The development of other renewable energy sources has made significant progress, however, reaching more than 27 Mtoe across the region in 2015 (up from 20 Mtoe in 1990). Despite their slow deployment, the outlook for renewables, wind and solar PV in particular, is promising and their share in electricity generation capacity is increasing (...).

HOW WILL GLOBAL ENERGY TRENDS AFFECT THE REGION – AND VICE VERSA?

Changes in the major energy markets will have far-reaching implications for the MENA region. Energy demand (for oil in particular) is increasing, especially in China, India and other Asian countries. Some countries, such as Indonesia, produce oil, but not enough to meet their growing energy demands. They will therefore have to turn increasingly towards the MENA countries to meet their needs. Already in 2012, the import share from the MENA region to the Asia-Pacific was 65 per cent. Asia consumed 53 per cent of total Middle East production in 2014. This trend is likely to continue, thus counterbalancing the shrinking level of exports to traditional commercial partners such as the USA, which is less and less dependent on energy imports from MENA. The US shale gas revolution has substantially reduced crude oil imports to the USA. However, an important factor to consider is price. Unconventional oil, in particular, in the USA is still not competitive with oil from the Middle East, and therefore the leadership of MENA countries in this market segment will not be challenged anytime soon.

These two opposing trends can be observed within individual MENA countries. By analysing the evolution of export levels from 2010 to 2016/17 in four MENA countries (Saudi Arabia, Iran, UAE and Algeria), two points can be inferred. Firstly, the overall level of exports declined considerably from 2010 to 2016/17. Secondly, the role of certain traditional commercial partners, such as the USA and Japan, has shrunk, whereas the relative importance of Asian players, in particular India and China, has grown. The

US share in oil export revenues in Saudi Arabia and the UAE has declined, whereas Asia's share has increased. In 2010, Saudi Arabia exported 31.41 billion US dollar-worth of oil to the USA, and 32.83 billion US dollar-worth to China. However, in 2017, Saudi exports to China and the USA declined respectively to 28 and 18.88 billion US dollars. Therefore, over the period, China's share has increased with respect to that of the USA. Similarly, in 2010, UAE exports accounted for 1.2 billion US dollars to the US and 4.45 billion US dollars to China. In 2016, a clear Asian preponderance in the export market was observed, with India reaching 19.24 billion US dollars, Japan 17.29 billion and China 9.99 billion, whereas the USA only purchased 0.9 billion US dollars. (…)

Another important factor is the decreasing cost of renewable energy technologies, driven by major markets such as China, which constitutes a real opportunity cost for MENA countries with far reaching economic benefits. The wider deployment of clean energy technologies will help direct some of the oil and gas in the fossil fuel exporting countries to international markets. For the energy importing countries, exploiting locally available renewable energy sources would increase their energy security by lessening their dependence on foreign energy sources. (…)

THE REGION'S ROLE IN THE OIL AND NATURAL GAS MARKETS IN LIGHT OF THE INCREASING IMPORTANCE OF UNCONVENTIONAL FOSSIL FUEL SOURCES, AND THE IMPACT OF ELECTRIC MOBILITY ON OIL DEMAND

With the exception of Algeria and Libya, all southern and eastern Mediterranean countries are currently net energy importers. In particular, the dependence rate on foreign resources in Jordan, Lebanon and Morocco is more than 90 per cent. Conversely, all GCC countries, plus Iran and Iraq, are energy exporting countries, as are the aforementioned Algeria and Libya. The region is endowed with a vast supply of fossil fuel resources, with some countries hosting the largest reserves of oil and gas at the global level, which has left many countries in the region well positioned to shape the energy landscape worldwide. Therefore, the abundance of fossil fuels puts the region in a favourable position to continue playing an important role in global energy supply.

Despite the many oil supply disruptions that occurred in several countries (Libya, Syria and Yemen) following the Arab uprisings in 2010, as well as the sanctions on Iran, crude oil production in the region has seen continuous growth to meet the growing energy demand both domestically and abroad. At the global level, three countries – Saudi Arabia (13 per cent), the USA (13 per cent) and Russia (12 per cent) – accounted for around 40 per cent of global crude oil production in 2016. The MENA region's

production accounted for around 38 per cent (34.6 billion barrels of oil/day) of total world oil production in 2016. It has maintained a 36–38 per cent share over the years, albeit with an annual increase of 1.9 per cent on average of production during the 1990–2016 period in absolute terms. Saudi Arabia has been by far the largest producer of crude oil in the world, while also accounting for 36 per cent of total production at the regional level. It also accounts for the largest share of OPEC's spare capacity (Saudi Arabia's spare capacity claimed to be around 2 mb/d), which could be brought very quickly to the market. With 13 per cent of the region's total production, despite security concerns, Iraq has continued to increase its output, reaching 4.5 mb/d. Iran has also increased its production following the lifting of sanctions, but the US retreat from the nuclear deal could potentially reduce investments in the sector and thereby output. The UAE accounted for 12 per cent of the region's production, with the remainder shared among the other countries, mainly Qatar, Algeria, Oman, Egypt and Libya. Despite the increase, Libya's output is still lower than it was prior to the social unrest.

With around 52 per cent (879 billion barrels of oil) of total proven oil reserves in the world, the region is undoubtedly at the centre of global oil supply. At the global level, Venezuela leads with 18 per cent of global oil reserves, followed by Saudi Arabia (16 per cent) and then Canada (10 per cent), while Iraq and Iran account for 9 per cent each. At the regional level, reserves are concentrated in the following countries: Saudi Arabia (30 per cent), Iran (18 per cent), Iraq (17 per cent), Kuwait (12 per cent), UAE (11 per cent), Libya (6 per cent) and Qatar (3 per cent). (...)

WHAT IS LIKELY TO BE THE IMPACT OF SHRINKING EXPORT LEVELS AND DECREASING OIL PRICES ON STATE REVENUES AND POLICIES IN THE FUTURE?

Following four years of stability at around 105 US dollars per barrel, oil prices dropped dramatically from 115 US dollars in June 2014 to 45 US dollars in January 2015. Since then, oil prices have partially recovered, reaching 65 US dollars in April 2018, but they are expected to remain within a relatively low trading price range of between 60 and 70 US dollars until the end of the decade, according to the IMF.

The macroeconomic consequences of these persistently low oil prices are far-reaching for the MENA region, both for oil exporting and oil importing countries. Variations in oil prices have an impact on oil and energy derived revenues and therefore on government budgets. According to the World Bank's 2015 MENA Quarterly Economic Brief, oil related revenues accounted for over half of government income in MENA's oil exporting countries in 2015. Therefore, a sustained low oil price results in significant

revenue losses for MENA oil exporting countries. Indeed, low oil prices from 2013 to 2016 have considerably reduced government surpluses and widened deficits in the region, with fiscal balances in MENA oil exporting states evolving from a 128 billion US dollars surplus to a deficit of 264 billion US dollars. GCC countries alone saw their oil revenues decline by 157 billion US dollars in 2015. According to the IMF, the countries whose current accounts were most impacted in absolute terms in 2015 were Kuwait, Qatar, Iraq, Libya, Saudi Arabia, Oman and Bahrain, all of which experienced substantial oil revenue losses (>20 per cent of GDP). As shown in Figure 13 from 2000 to 2013, MENA states' overall fiscal balances were positive at a surplus of 2.7 per cent of GDP. However, following the oil price drop in mid-2014, fiscal balances dropped to a level of -2.8 per cent of GDP in 2014, reaching a low of -9 per cent of GDP in 2016, and they are forecasted to be around -4.1 per cent of GDP by the end of 2018.

In 2016, with a yearly average oil price of 43 US dollars a barrel, not a single MENA oil exporting country was able to fiscally break even. In 2018, a slightly higher oil price of around 65 US dollars eased the tension on MENA's oil exporters' current accounts. Indeed, several states such as Kuwait, Qatar, UAE, Iran and Algeria so far have broken even. However, the remaining states still require higher oil prices for their budgets to reach equilibrium. It must be noted that some GCC oil exporters such as Saudi Arabia have the capacity to alleviate the impact of low oil prices with massive sovereign wealth funds or reserve assets. However, other more vulnerable oil exporting countries such as Yemen and Libya, whose budget revenues are 95 per cent dependent on oil revenues, do not benefit from such buffers.

In the case of MENA's oil importing countries, economic activity should be stimulated because low oil prices increase households' and firms' real income. The World Bank quantified that a 10 per cent decrease in oil prices could raise growth in oil importing economies by between 0.1 and 0.5 percentage points, depending on the country's ratio of oil imports to GDP. Beyond economic growth, low oil prices also bring gains to oil importing countries via their fiscal accounts.

Moreover, MENA oil importing states witnessed improvements in their budgets in the aftermath of the 2014 oil price drop because of lower import bills alongside eased fiscal burdens due to lower costs for fuel subsidies. Overall, (...) budget deficits observed in the MENA oil importing countries narrowed from -7.2 per cent of GDP in 2015 to -5.9 per cent of GDP in 2018 and this trend is forecasted to continue, reaching -5.2 per cent of GDP in 2019. The states whose fiscal balances gained the most from 2015 to 2016 were Lebanon (1.75 percentage point of GDP) and Egypt (0.5 point of GDP). Nevertheless, the IMF and independent studies have pointed out that indirect factors could, in the medium term, counterbalance the benefits of low oil prices for MENA oil importers. In addition, an economic slowdown

in MENA's oil exporting countries resulting from low oil prices could impact MENA's oil importing economies through trade remittances, grants and foreign direct investments (FDIs). The relative importance of the direct positive impact of lower oil prices and the negative impact of spillovers from exporting countries varies greatly between MENA importers. (…) Mohaddes and Raissi calculated that a 51 per cent drop in the price of oil in year 1 and a 45 per cent drop in year 2 following a supply shock would benefit Egypt and Mauritania by +0.2 per cent of GDP, equivalent to an influx of 670 million US dollars and 10 million US dollars into their economies respectively. By contrast, negative spillover effects would dominate in Jordan, Morocco and Tunisia, affecting their economic growth negatively by by -0.5 per cent, -0.7 per cent and -0.2 per cent respectively, representing a loss for these economies of 190 million US dollars, 700 million and 90 million respectively.

Furthermore, along with other endogenous factors, low oil prices boost domestic demand for oil in MENA states. This is particularly problematic for MENA's oil exporting countries. In 2015, 33 per cent of the oil produced in the Middle East was consumed domestically, whereas in 2000 the figure was only 20 per cent. This energy consumption trend will prove unsustainable if current export levels and derived government revenues remain unchanged. Domestic oil consumption in Saudi Arabia reached 32 per cent in 2015 compared with 17 per cent in 2000. Under a business as usual scenario, forecasts indicate that if other sources of energy are not exploited or if actual oil consumption patterns are not modified, Saudi Arabia's oil production could be completely absorbed by domestic consumption by 2038. Thus, in the medium to long term, the more pressing challenge for MENA's exporting countries is rising oil demand rather than low prices. This could make it difficult for countries in the region to sustain their economic development with regard to vast public spending, particularly the dilemma of supplying citizens with cheap subsidized oil, fuelling household demand and in turn leading to a decline in export capacity. This should lead MENA governments to reform their policies in order to reduce their vulnerability to oil price fluctuations and macroeconomic shocks as well as to increase trade with economies with potentially high oil demand.

HOW CAN RENEWABLE ENERGY SOURCES HELP MENA COUNTRIES RETAIN THEIR LEADERSHIP POSITION IN GLOBAL ENERGY MARKETS?

As highlighted earlier, meeting the rapidly growing domestic energy demand, particularly for electricity, is a real challenge facing all MENA countries. The main conundrum is that increased domestic energy demand would mean that less spare export capacity would be available for export, thereby diminishing the importance of the MENA region in global energy markets. Addressing this challenge with demand side management,

including energy efficiency measures, could eventually slow this growth, but more is needed. Alternative energy sources, in particular the deployment of renewable energy technologies on a wider scale, could address this challenge and thereby help MENA countries (oil and gas rich countries in particular) retain their important role in global energy markets.

The region is well suited to the development of renewable energy technologies for different applications. As far as solar energy technologies are concerned, most of the countries are located in the so-called sunbelt, with global horizontal irradiance (GHI) values ranging from 1,600 kilowatt hours per square metre per year (kWh/m^2/y) in coastal areas of the Mediterranean to 2,600 kWh/m^2/y in the desert, and direct normal irradiance (DNI) varying from 1,800 kWh/m^2/y to more than 2,800 kWh/m^2/y. This is one of the best endowed areas of the world with respect to solar energy for both solar photovoltaic (PV) and concentrating solar power (CSP) applications. The potential for wind energy is also very high in several countries of the Mediterranean such as Morocco, Egypt and Turkey, as well as Iran, with more moderate – but still promising –potential in the GCC countries and Iraq.

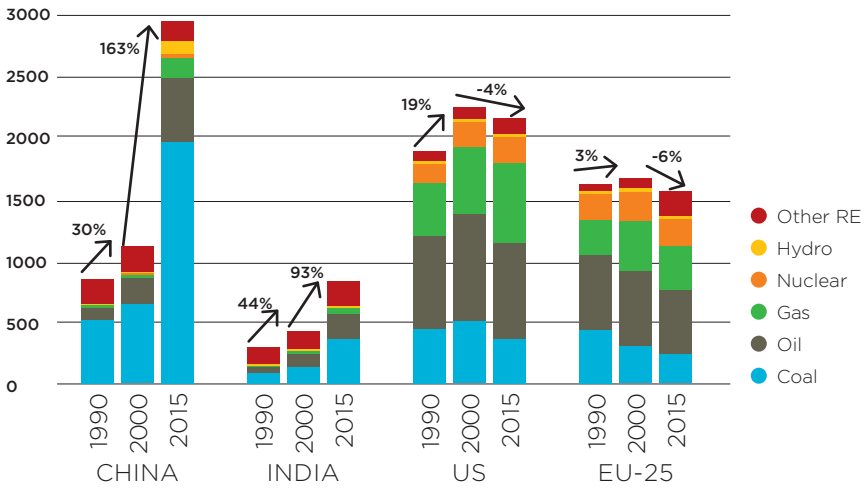
Despite this significant potential, the pace of deployment has been very slow in many countries with the exception of a few such as Egypt, Tunisia, Turkey, Morocco, Jordan, Israel and the UAE. While leading countries (mentioned earlier) are keeping up with this momentum, others are finally realizing this potential and are thereby pushing ahead with their national renewable energy plans albeit at a slow pace.

However, there are several obstacles to the deployment of renewables in the MENA countries that need to be overcome, including weak grid infrastructure, regulatory barriers, access to finance and, most importantly, subsidies to conventional energy. In the GCC countries, for example, the low penetration of renewable energy technologies can be attributed to institutional inertia, no clear separation of roles and responsibilities at the institutional level and the absence of dedicated policies and regulations.

Renewables' role in the energy mix (about 35 Mtoe – equivalent to about 3 per cent of TPES – in the whole region) has been negligible in most MENA countries, especially in hydrocarbon exporting countries. Hydropower is still the main renewable energy in the MENA region, reaching 9 Mtoe in 2015. However, in addition to biomass, the development of other renewable energy sources, mainly wind and solar, has progressed significantly, reaching more than 27 Mtoe for the whole MENA region in 2015. The deployment and significance of renewable energy is particularly notable in the power sector. As far as installed electric capacity is concerned, more than 11 GW of non-hydro installed capacity were in place as of 2016, distributed among the following: wind (7.5 GW), solar PV (1.7 GW), geothermal (0.775 GW), biomass and waste (0.650 GW) and solar CSP (0.347 GW). Hydropower capacity alone totaled about 49 GW in 2016.

A number of countries have made significant progress in implementing renewable energy projects (excluding hydro). In the southern and eastern Mediterranean countries, Turkey, Morocco, Egypt, Israel, Jordan and Tunisia lead the renewable energy market in the region. Renewable installed capacity in Turkey stands at more than 11 GW (mainly wind energy, but most of the installed PV capacity was completed in 2017). Morocco is on track to achieve its 2020 renewable energy targets with more than 1.2 GW existing capacity in place. A number of large-scale projects are either under construction or under development, including the 850 megawatt (MW) wind project and the ongoing construction of the second, third and fourth phases of the Ouarzazate Noor solar complex as well as other solar projects. With more than 800 MW in place, Egypt is making good progress in its renewable energy programme, including the 2 GW PV under the Feed-in Tariffs scheme. Jordan is also advancing on its renewable energy projects, especially solar PV. After its slow uptake of the Tunisian Solar Plan, renewable energy investments are, finally, gaining momentum in Tunisia, with the recent pre-qualification calls for tender for wind and solar photovoltaics projects announced in May 2018, which would give new impetus to renewable energy projects. Israel is also making good progress in meeting its renewable energy targets, especially solar PV, with the highest installed capacity in the region, but also CSP projects. While Algeria has fallen short of its ambitions (although it has achieved important milestones, including several off-grid PV installations in 2016 and 2017 in the south of the country), the political situation in Libya has prevented progress on the implementation of renewables.

ENERGY DEMAND CHANGE IN MAJOR MARKETS



Despite high ambitions, progress in the renewable energy market in the other GCC countries is still lagging. Nevertheless, the UAE is leading the renewable energy market with an existing installed capacity of 357 MW, and with very large-scale solar projects. The 200 MW first stage of the 800 MW third phase of the Mohammed bin Rashid Al Maktoum Solar Park has been inaugurated, with the third and fourth phases totaling 600 MW to be commissioned in 2019 and 2020. In addition, the first stage of the CSP 700 MW fourth phase is envisaged to be commissioned by 2020. After long delays, the Saudi National Renewable Energy Program finally awarded its first 300 MW solar PV project at Sakaka to ACWA Power in early 2018, which is expected to be operational by 2019. The Saudi National Renewable Energy Program intends to install a capacity of 9.5 GW by 2023, with the aim of also developing a local manufacturing industry, but the speed of implementation is quite slow. In comparison, the estimated renewable energy potential is 200 GW. Through the development of renewables and the expansion of the grid, this could potentially help Saudi Arabia play an important role in the regional renewable energy market. However, a clear strategy is needed.

There are several obstacles to the deployment of renewables in the MENA countries that need to be overcome, including weak grid infrastructure, regulatory barriers, access to finance and, most importantly, subsidies to conventional energy

Currently, there are several obstacles to the development of renewables in the region. Therefore, an enabling environment is key to the wider development and deployment of renewable energy technologies and to attracting investments to the sector. In order to encourage the deployment of projects, a number of countries have adopted a mix of supporting tools, including renewable energy plans and objectives, tendering, price mechanisms (feed-in tariffs and feed-in premiums), quota systems and tax incentives as well as long-term power-purchase agreements (PPA) – the latter is undoubtedly one of the unlocking measures for renewables potential. In particular, government backed tenders have resulted in some of the most cost-effective projects at the global level for solar and wind, with record low prices in Morocco and the UAE. The world record low price of 73 USD/MWh for CSP with storage of the giant 700 MW project in Dubai announced in September 2017 might promote uptake of the CSP market in the future in the whole region. In Morocco, record bids of around 30 USD/MWh for the 850 MW wind project are among the lowest prices announced for wind energy in the world.

Despite encouraging progress, and in order to maintain momentum, further changes are needed in order for MENA countries to be able to ex-

ploit their renewable energy potential and position themselves as sustainable energy champions. Although the amount of progress made varies by country, the main transformations required should occur at the following levels: (1) mandatory renewable energy targets set within a stated deadline; (2) establishment of an institutional framework with clear allocation of roles and responsibilities to allow for a transparent market; (3) definition of fair rules to guarantee market access to independent power producers; (4) adoption of policy support measures for renewable energy projects based on the project scale, the degree of maturity of the technology and the type of application (electricity vs other use); (5) gradual phase out of subsidies for conventional energy technologies; (6) accurate market design and overall assessment of the impact of renewable energy's increasing share on the grid; and (7) access to finance and ease of raising capital, especially access to lower-cost finance, which will be necessary for the wider deployment of renewable energy technologies.

Material factors for the MENA region: Energy trends

EMANUELA MENICHETTI, ABDELGHANI EL GHARRAS & SOHBET KARBUZ

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The unconventional gas revolution

The so-called unconventional gas revolution began more than a decade ago with low-cost coalbed methane, followed by the productive tight gas development and the emergence of shale gas. These developments have revolutionized gas supply in the USA, such that unconventional gas production has overtaken conventional gas production. This quick growth has had a significant impact on gas markets and thus attracted worldwide attention.

The intensive use of advanced technology has made it possible to unlock vast tracts of unconventional gas deposits. Three technologies have supported the rise in unconventional gas production, namely hydraulic fracturing, horizontal drilling and micro-seismic monitoring. The first steps towards development of the current technologies that allow for the successful commercial exploitation of shale gas resources were taken in the late 1990s by Mitchell Energy in the Barnett Shale.

Unconventional gas production volumes continued to rise with the development of technological advances during the 1990s. In the 2000s, increased production from those resources offset the decline in conventional gas production and drastically reversed the decreasing trend in total US domestic natural gas output.

US shale gas production was 5 percent of total US gas production in 2004, 10 percent in 2007 and 60 percent in 2016. According to the US Energy Information Administration (EIA), shale gas production is expected to continue to increase in the future. This development has turned the USA from a gas importer in 2007 to a gas exporter in 2016. As a result, the USA no longer needs to import gas from the MENA region. The US shale revolution, combined with the rapid expansion of LNG capacity worldwide, has already started to reshape the regional and global natural gas market. These developments have put pressure on the price of natural gas in all major gas markets. This has implications also for the price of natural gas liquids (separated from natural gas in processing plants) that are used as feedstock in the petrochemical industry. This means that the shale gas revolution is not only a challenge to the MENA region in gas export markets, but will also be a threat to the expansion of the chemical and petrochemical industry in the region, which is export oriented.

CONCENTRATION INDICES FOR KEY VARIABLES BY COUNTRY FOR THE MENARA STUDY AREA

Country	Population concentration (2015) %	Population change concentration (1975-2014) %	Rainfall concentration %	Productivity concentration %	Energy demand concentration %
Algeria	93	97	57	92	89
Bahrain	62	56	2	43	27
Egypt	94	9	65	93	87
Iran	83	94	27	65	65
Iraq	84	90	34	65	72
Israel	48	41	16	30	26
Jordan	87	90	28	87	75
Kuwait	87	86	5	78	38
Lebanon	54	40	10	26	31
Libya	97	99	60	96	93
Mauritania	93	100	35	80	99
Morocco	70	89	27	58	74
Oman	89	99	21	90	74
Qatar	81	85	4	75	38
Saudi Arabia	94	98	22	85	78
Sudan	90	98	43	63	96
Syria	71	76	26	60	68
Tunisia	77	86	34	67	60
Turkey	72	81	11	24	54
UAE	91	96	12	80	54
West Bank	48	41	16	30	26
Western Sahara	93	100	7	93	99
Yemen	80	94	24	80	82

While the amount is thought to be large, estimates of shale gas resources outside the USA are severely hindered by the lack of field data. A comprehensive assessment of shale gas potential covering the regions outside the USA was published by the EIA in 2011 and 2013. These reports show that some countries in the MENA region (for instance, Algeria and Libya) have large-scale shale gas resources. However, shale geology know-how is still in its infancy in the region, and shale gas resources have not yet been quantified on a national basis for most countries. For instance, it is acknowledged that potentially productive shales exist in most of the countries in the Middle East, yet they are not included in the aforementioned reports as they lay outside the scope of the study.

The number of LNG exporting countries has also risen tremendously, from one in 1964 to over twenty in 2017

Many prospective shales, particularly those in Europe, have turned out to be more geologically complicated than expected. This has implications for the technical and economic viability of their exploitation, and thus the willingness of companies to invest in their development. Despite the initial excitement, the European shale gas boom has not materialized in the way many people predicted. While opportunities appear to be abundant, there are still plenty of challenges to be overcome and the region will be hard pressed to replicate the success of the USA.

Some of the challenges are technical in nature and are related to different material factors, whilst others are inherently political, legal or economic. The latter challenges include a difficult and uncertain fiscal, legislative and regulatory climate; a cumbersome bureaucracy with lengthy permitting procedures; public opposition or lack of public acceptance; and opposition by local citizens to shale gas projects. Mounting concerns about the environmental effects of shale gas in general and hydraulic fracturing in particular have helped mobilize public opposition and slowed the development of shale gas activities in Europe and parts of North Africa. These concerns are primarily related to four issues: water management, possible climate impacts, seismic activity, and risks to human health and other activities.

While some governments are supportive of the exploitation of shale gas, others have banned its development and/or the use of fracking technology. France was the first country in Europe to explicitly outlaw hydraulic fracturing and shale gas extraction in July 2011. Many others followed, either imposing moratoriums or forbidding activities using fracking. And in some countries, such as Tunisia and Algeria, the idea of shale gas exploitation has been met with immense public criticism and demonstrations. Partly as a result of all this, even in the most pro-shale countries no com-

mercial production has yet been achieved. Most, if not all, experts argue today that shale gas will not be produced commercially and in significant volumes in the short to medium term in Europe. Prospects for its full utilization may only be realistic in the long term. LNG, however, is expected not only to play an increasingly important role in filling the future gas supply gap but also to help improve supply security by providing flexibility and diversification through multiple supply options.

THE LNG REVOLUTION

The rise of shale gas production in the USA has shifted the market outlook from scarcity to abundance and driven the USA into the LNG export business. Cheniere Energy Inc. started exporting from its Sabine Pass LNG facility in Louisiana in February 2016. As of September 2017, more than 150 cargoes (over 17 bcm), have been shipped to international markets, from Asia to Latin America to Europe. The USA is now projected to become one of the top three LNG exporters in the world in the next few years, according to industry experts.

We are currently witnessing a paradigm shift in LNG markets. LNG is arguably the fastest growing segment in the global energy business. In addition, LNG has recently become a global commodity business. This has not happened overnight. Technological innovation has contributed to the LNG revolution. The modularization of liquefaction plant facilities and the emergence of small-scale floating storage regasification units (FSRUs) have played an important role in the growth of the LNG trade. Since FSRUs are quick and relatively cheap to install, new markets have opened up. First deployed in the US Gulf of Mexico in 2005, FSRUs have now become a standard industry technology.

Largely due to the development of FSRUs, the global LNG trade started to gain momentum in the past decade. According to the IEA, a more flexible global gas market, coupled with a doubling of trade in LNG, supports an expanded role for natural gas in the global mix. By 2040, more than half of the world's gas trade will be via LNG rather than pipeline, according to the IEA.

The volume and diversity of LNG trade flows have increased rapidly with the appearance of new exporting and importing countries. From the first LNG shipment from Algeria to the UK in 1964, LNG has been gaining importance in gas trade. The number of LNG importing countries has grown from one in 1964 to fifteen in 2005 and thirty-nine in 2017. In this period, more and more countries in the region have become LNG importers. Other countries, such as Morocco, may also join this group in the future.

The number of LNG exporting countries has also risen tremendously, from one in 1964 to over twenty in 2017. Booming gas production and high

gas prices have motivated many countries to expand their LNG export capacities or to become gas exporters by building LNG plants. In the MENA region, Qatar (the largest LNG exporter in the world), Algeria, Oman, UAE, Egypt and Yemen are among the LNG exporting countries. Due to ongoing conflict and instability, LNG exports from Yemen have stopped. An emerging problem, however, is that the LNG export rush has created excess supply, which may be extended as far as 2025. The shift in the LNG market, from a period of undersupply and high prices in 2011–14 to a glut of new supply today and in the near future, has begun to change the dynamic in LNG markets. First, oversupply, the substantial volume of uncontracted LNG and the decline in the price of oil have brought down natural gas prices in all regions. Second, ample availability of LNG has allowed buyers to improve their competitive positions, allowing them to put pressure on the pricing and marketing of LNG.

Buyers no longer want price indices to be tied exclusively to the oil price, which is why global pricing formulas have shifted away from oil indexation, from more than three-quarters for contracts signed before 2010, towards more gas-to-gas linkages (around 50 percent) in newer contracts. The inclusion of fixed destination clauses in LNG contracts declined from 60 percent in 2014 to less than 40 percent in 2016. If this trend continues, it will likely result in a fight for market share among exporters, particularly in Europe. EU competition law, for instance, is considering the prohibition of market segmentation by means of destination clauses in gas contracts. More importantly, there has been an increase in spot trade and shorter-term contracts. Spot and shortterm trades represented around 30 percent of overall trade in 2016. In addition, buyers are now pushing to renegotiate or exercise price redetermination clauses. All these developments mean that LNG is becoming a deeper, more liquid and more commoditized market.

Energy relations between Turkey and Israel

AYBARS GÖRGÜLÜ & SABIHA SENYÜCEL GÜNDOĞAR

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After six years of détente, on June 2016 Israel and Turkey finally reached a deal to normalize diplomatic relations and signed a reconciliation agreement. Israel-Turkey relations had already been broken after Israel's offensive in Gaza between December 2008 and January 2009 (...).

Ankara's reaction to Israel was to downgrade relations with Israel to the minimum level; its Ambassador to Israel was recalled and the Israeli Ambassador was expelled from Turkey. Official relations collapsed. Additionally, Ankara listed three conditions that would normalize relations with Israel: an official apology, compensation for the families of the deceased and the lifting of the sea blockade on Gaza. The situation remained frozen until March 2013, when Israeli Prime Minister Benjamin Netanyahu officially apologized to Recep Tayyip Erdogan, who was the Prime Minister at that time. The negotiations discussed the terms for a reconciliation agreement for almost three years. Reaching a final agreement was not easy, and high level officials met several times to agree on a deal. (...)

The Turkish Parliament belatedly ratified the deal on 20 August, owing to the bloody coup attempt of 15 July in Turkey; by that time, the Israeli cabinet had already ratified the deal. Immediately after the attempted junta, statements were issued that the Israeli-Turkish reconciliation would not be affected and continue as planned. Consequently, on 31 August 2016, Turkish President Erdogan signed the deal. Now it is a matter of time before we see the mutual appointment of ambassadors and opening of channels for dialogue. (...)

Besides regional dynamics, the Israel-Turkey reconciliation cannot be fully understood without considering energy-related factors. Energy politics is not independent from regional and strategic issues, and cooperation regarding energy is likely to be on the agenda of both countries for various reasons. Put simply, Israel is looking to export its gas and benefit from gas wealth, while Turkey is seeking alternatives to meet its gas demand. Negotiations are expected to kick off as regards the sale of natural gas from Israel to Turkey and the construction of a pipeline that will carry natural gas through Turkey to Europe. In this context, the deal seems to be a win-win for both countries. Nevertheless, while noting the significance of the energy dimension, the economics and politics of such deals should not be

overlooked. There are hurdles as far as investment is concerned, and the Cyprus issue has yet to be tackled. The political and economic feasibility of the plans regarding energy resources requires further examination, as well as consideration of the extent to which they will present an incentive to push the two countries closer together. Therefore the potential for energy cooperation requires closer assessment, as do the probability of and conditions for its success.

WHAT IS THE POTENTIAL IN THE EASTERN MEDITERRANEAN BASIN?

The discoveries in the Levant Basin, especially in Tamar, Leviathan and Cyrus-A, have introduced a new game of energy politics, as the basin includes offshore territories that include the Gaza Strip, Israel, Lebanon, Syria and Cyprus. The located offshore gas deposits in Israel and Cyprus have the potential to end both countries' dependence on imported energy. On a broader scale, these emerging resources also have the capacity to supply the natural gas needs of the Mediterranean and Eastern European regions. This denotes a regional diversification of supply resources and routes of energy for both Turkey and Europe, and the development of closer political ties in the region by means of natural gas supply. The United States Geological Survey of 2010 predicted that undiscovered oil and gas resources in the Levant Basin Province were nearly 1.7 billion barrels of oil and 3,450 billion cubic meters (bcm) of natural gas. Resource estimates are naturally less precise than proven reserves, and approximately 950 bcm in proven gas reserves are confirmed so far. Even though these are not enormous reserves in comparison to those in the USA, Russia, the Caspian Basin or North Africa; they surely signify a notable discovery and a serious game-changer in a region where countries including Turkey, Israel and Cyprus, as well as the Eastern European countries, are highly dependent on energy imports. Turkey, for example, consumes nearly 50 bcm of natural gas every year, and its appetite for more energy continues to increase dramatically.6 The Trans-Anatolian Natural Gas Pipeline (TANAP) between Turkey and Azerbaijan, financed by the State Oil Fund of the Republic of Azerbaijan (SOFAZ), is planned to be operational in 2017 and will start with a 16 bcm capacity. (...)

Turkey's current key energy policy is to diversify its resources and routes; and the constantly expanding economy and growing population push the country towards new energy deals. Furthermore, Turkey is largely dependent on Russia, Azerbaijan and Iran for its energy supply. It is similarly estimated that oil imports in Europe will increase by up to 95 percent and gas imports from 63 to 80 percent by 2030; and Europe is already the second largest market of Gazprom. Given the factors above, new discoveries could save Turkey and Europe the inconvenience of relying on a

few energy suppliers and help them enhance their energy security. The potential amounts of gas supply in the Leviathan field are quite intriguing, but the discoveries have also triggered various political manoeuvres and discussions on export and energy security. The rise of the Eastern Mediterranean as the potential gas supplier of Europe is appealing, yet a cautious approach is necessary since there are still various obstacles.

WHAT ARE THE OBSTACLES TO REALIZING THE POTENTIAL?

The ambitious sub-sea pipeline from Israel's offshore Leviathan gas field to Ceyhan (Turkey) would be one of the more inviting projects of the Middle East, if it materializes. Nonetheless, the project is – and will be – facing a number of difficulties before it is able to succeed. The first impediment pertains to internal Israeli discussions about the right of use of the energy site. While gas extraction at the Tamar field began in 2013, and still provides Israel with its current natural gas supply today, development of the Leviathan field has faced political and legal obstacles that have resulted in delays to its construction plan. Noble Energy of the USA and Delek Group of Israel – the latter already controlling the Tamar field – are in charge of Israel's natural gas supply control. Opposition parties and advocacy groups from Israel have reacted to this excessive control by international companies and have advocated nationalization of the stakeholder structure. The protests and concerns have led public authorities to work on a revised government policy for the natural gas industry. Currently, the consortium controlling the Leviathan gas field is made up of the Delek Group, owning a total 45.34 percent stake, with its subsidiaries, Delek Drilling and Avner Oil Exploration, each holding 22.67 percent; Noble Energy, which has a 39.66 percent share; and Israel's Ratio Oil, which owns the remaining 15 percent.

The Israeli government and the consortium of companies finally agreed on a legal framework in May 2016 for the development of the Leviathan gas field. This entails a two-phase construction plan of eight drilling wells to produce 21 bcm of gas per year. The field will become operational by the end of 2019, as specified in the deal, if no new disputes result. Though the problem seems to have been disentangled, the process was long and complex, which means future investors for the Leviathan field could be hesitant about Israel's internal complexity and opacity of regulation. The second issue relates to finance. The pipeline construction, infrastructure and running costs are estimated to be quite high. Keeping in mind the volatility of the region the pipeline will need to cross, the investors of the pipeline will be undertaking a risk that is not minimal. Furthermore, global energy prices have fallen sharply over the past two years, leading to significant revenue shortfalls in energy exporting countries. In addition to this drop in prices, proven and estimated natural gas reserves are increasing world wide. Israel is just one of the countries that has

discovered gas. The abundance of natural gas is a direct threat to the export of Israeli gas, which requires significant investment in a volatile region. Naturally, Israeli gas will not stand a chance if it does not sell at a competitive price in the energy market.

The Israeli government and the consortium of companies finally agreed on a legal framework in May 2016 for the development of the Leviathan gas

The decreasing prices for energy supply have yet another implication for Israel. For the project to become feasible for investors, it needs to secure more markets. Egypt is one of these, but it is no longer enough on its own. Concerns have also been raised about using Egypt's liquefied natural gas (LNG) complexes. The low oil/gas prices make this facility, which would export the gas to Europe, economically unfeasible. Just as importantly, the political instability in the country raises many questions. Because of this, Turkey seems to be the most reliable partner, and would become at the same time the second secured market for the export of Israeli gas, which would reduce the investment risks.

Lastly, and probably the most critical issue standing in the way of establishing a pipeline, is the conflict between Cyprus and Turkey. This is the sine qua non of the issue. Accordingly, two routes are possible for the Israel-Turkey pipeline. The first and more cost-effective route would be through Lebanon and Syria. However, this would mean crossing two countries with high political and security risks. The other route goes through the territorial waters of Cyprus; and this, once again, brings the Cyprus conflict under the spotlight. Such a route would necessitate the approval of the Cyprus Republic; which Turkey does not recognize. Therefore, without resolution between Cyprus and Turkey, it is difficult to see a sub-sea gas pipeline operating in the Mediterranean.

What to expect?

The energy landscape of the Eastern Mediterranean and the Middle East has the potential to go through a phase of development because of the Leviathan and Tamar gas fields in Israel. Israel forecasts the use of its gas fields not only as a secondary supply for its domestic use, but also for its export market. With the latest natural gas framework, the Israeli cabinet has decided to allow exports of up to 40 percent of the country's gas reserves. This means that in the context of the increased reserve capacity of the Leviathan field, Israel will be able to export a total amount of 440-450 bcm by 2040. This is a vast amount of natural gas, which would create the possibility of supplying it to neighboring countries and EU countries at the same time. The next questions are to whom, and through which route this gas could reach out to the European market.

Morocco and its quest to become a regional driver for sustainable energy

ABDELGHANI EL GHARRAS & EMMANUELA MENICHETTI

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Lack of fossil fuel resources, high energy import bill, and rising energy demand, electricity in particular, together with positive energy dynamics at the global level, especially the decreasing costs of renewable energy (RE) technologies and access to climate finance, have pushed Morocco to develop alternative, reliable and sustainable renewable energy. These dynamics have been translated by the adoption of an energy strategy, supported by royal willingness, putting renewables at the forefront of Morocco's energy policy (setting one of the highest RE objectives in the region), and thereby making of Morocco a regional leader in clean energy technologies. The deployment of renewables at a wider scale could potentially be an example for all countries in the region and elsewhere. Sharing best practices and know-how on renewables as well as making good use of energy trade and infrastructure opportunities embed Morocco both at the regional and the international levels.

Unlike other countries in the Middle East and North Africa (MENA) region, especially the Gulf Cooperation Council (GCC) countries, Morocco is a net energy importer, with more than 90 per cent of its energy needs met through imports, thus putting pressure on its fuels-import bill. After four consecutive years (2012–2016) of decline, reaching 55 billion Moroccan dirhams (MAD) in 2016, net energy import bill increased by more than 25 per cent in 2017, reaching 69 billion MAD, due mainly to increasing prices at the international markets. Morocco's energy mix is still heavily characterized by fossil fuels' predominance, with around 88 per cent of total primary energy demand is met through coal, oil and gas.

Electricity demand, in particular, has been growing faster than overall energy demand. Electricity consumption more than doubled between 2000 and 2015 (moved from 13 terawatt hours or TWh to 30 TWh). In addition to increasing population, urbanization and improved standards of living, the increasing electricity demand could also, partly, be attributed to extending electricity access, especially under the Programme d'Electrification Rurale Global (PERG) that was initiated in 1996 as rural electrification rate moved from a very low base of 18 per cent in 1995 to 99.42 per cent in 2016. The

electricity sector is driving growth in renewables in Morocco, which occupies the leading position at the regional level in terms of increasingly integrating renewable energy sources in the country's power sector. As of 2017, renewables became the first generating source, reaching around 3 GW (around 34 per cent of total electricity installed capacity – 8,840 MW), and with the recent commissioning of projects under PV I phase (170 MW solar PV) and the expected commissioning of NOOR II (200 MW concentrated solar power, or CSP) and NOOR III (150 MW CSP) by end of this year, the RE installed capacity should reach 37 per cent of total installed capacity. (...)

Morocco is a net energy importer, with more than 90 per cent of its energy needs met through imports, thus putting pressure on its fuels-import bill

RENEWABLES' DEPLOYMENT FRAMEWORK ENVIRONMENT: AN EVOLVING REGULATORY, POLICY AND INSTITUTIONAL FRAMEWORK

In 2009, Morocco has embarked on new initiatives to tap its renewable energy sources, especially solar and wind energy. Morocco has laid down the needed legal, regulatory and institutional frameworks, including a national energy strategy adopted in March 2009 with renewable electricity targets (a 42 per cent of renewable installed capacity by 2020). This vision has been further revised upward with a new target of 52 per cent by 2030. Undoubtedly, by setting a 2030 target, this would give a clear positive signal to investors about the country's commitment to developing renewables.

The legal framework has been strengthened through adopting several laws promoting renewable energy investments, especially Law No. 13-09 on renewable energy and Law No. 58-15, amending and supplementing the Law No. 13-09. The institutional framework for the promotion of renewable energy in Morocco has been evolving and is under consolidation with the restructuring of old entities and the creation of new ones. The former Renewable Energy Development Center (Centre de Développement des Energies Renouvelables, CDER) has been turned into an agency in 2010 focusing both on renewable energy and energy efficiency, thus becoming the National Agency for Development of Renewable Energy and Energy Efficiency (Agence Nationale pour le Développement des Energies Renouvelables e de l'Efficacité Energétique, ADEREE). Along the same lines, in 2010 the Moroccan Agency for Solar Energy (MASEN) and the Energy Investment Company (Société d'Investissements Énergétiques, SIE) were created in 2010. In 2017, reforms led to the empowerment of MASEN, which was renamed the Moroccan Agency for Sustainable Energy, enlarg-

ing its mandate to include all renewables. ADEREE's mandates have been limited to energy efficiency (mandates related to renewables for domestic use are maintained, however), becoming the Moroccan Agency for Energy Efficiency (Agence Marocaine pour l'Efficacité Energétique, AMEE).

Nevertheless, the creation of several institutions and agencies makes the electricity market more complex, and coordination efforts challenging. Thus, the establishment of an independent energy regulator responsible, among others, for licensing and setting tariffs, overseeing the electricity market, and enforcing regulations is of high importance. In this direction, Morocco finally gave its green light for the establishment of an independent electricity regulator – the National Authority for Electricity Regulation (Autorité Nationale de Régulation de l'Électricité, ANRE) in August 2018. (...)

DIVERSIFIED FINANCING STRUCTURE

Several financing sources exist for renewable energy investments in Morocco. An Energy Development Fund (FDE) with a starting capital of 1 billion US dollars was created in 2010 to 9 support energy projects, including renewable energy. Through its subsidiary MASEN Capital, MASEN is also contributing equity finance to renewable energy projects. International financial institutional, multilateral development banks and donors (including grants and concessional loans providers), in particular, have played an important role in financing renewable energy projects in Morocco. The first phase of Ouarzazate NOOR I (160 MW CSP) attracted several key actors, including the World Bank Clean Technology Fund (CTF), the European Investment Bank (EIB), KfW Development Bank and the African Development Bank (AfDB), etc. With very attractive financing conditions, the involvement of such institutions has contributed in bringing the price down. (...)

From an energy perspective, energy infrastructure, including cross-border electric interconnections, pipelines, and knowledge-sharing are other facets for integration and cooperation, making Morocco embedded in the international order.

***Cross-border interconnections**:* This embeddedness is exemplified by the following existing and future interconnections.

- *Morocco-Spain*: Morocco is connected to Spain with two lines; the first commissioned in 1997 and the second one in 2006 with a total capacity of 1,400 MW. ONEE has been the fourth operator in the Spanish market since 1999. A third interconnection (700 MW) is planned between the two countries. Between 15 and 20 per cent of Morocco's electricity demand is imported from Spain.
- *Morocco-Algeria*: Morocco is also connected with Algeria with four lines with an exchange capacity of 1,500 MW. Two lines were com-

missioned in 1988 and two others in 2008. Contrary to the one connecting Spain, not many electrons are exchanged between the two countries, however.

Other potential interconnections are also under study.

- *Morocco-Portugal*: Two lines with Portugal are foreseen and for which the feasibility study is in progress.
- *Morocco-Mauritania*: This is also under study. As a first step, the Laayoune-Dakhla line is under construction.

Having a South-South and North-South interconnection grid will definitely help creating a regional electricity market and further embeddedness of the countries at the regional level.

Pipelines: This strategic choice has been first inaugurated with the Maghreb-Europe Gas Pipeline exporting Algerian gas to Europe, and could also be further strengthened through the ambitious plan to construct another pipeline transporting Nigerian gas to Morocco, passing through West African countries, and eventually connecting to Europe.

- *Algeria-Morocco-Europe*: Morocco is connected to Europe through the Maghreb-Europe Gas Pipeline. The pipeline carries natural gas from Hassi R'Mel in Algeria to Spain and Portugal. On average 30 per cent of natural gas consumed in the Iberian Peninsula is transported through this section.

This South-South orientation for regional cooperation and integration of Morocco can be demonstrated through the ambitious initiative of the Moroccan-Nigerian gas pipeline.

- *Moroccan-Nigerian Gas Pipeline* crossing six other countries, to export Nigerian gas to Morocco and potentially to Europe. Once completed, the pipeline would allow Morocco to diversify its energy mix, reduce its dependence on Algerian gas; eventually improve the European countries energy security thus becoming less dependent on Algerian and Russian gas; increase energy access in west African countries; and potentially create an integrated economic zone with West Africa. (...)

OVERCOMING THE CHALLENGES IS KEY TO FULLY EXPLOITING OPPORTUNITIES

Several risks have been identified that could be a challenge for the wider scale deployment of renewables in Morocco.

- Grid access: Despite the enactment of Law No. 58-15 (amending and supplementing Law No. 13-09 on renewable energy), the private producers still do not have access to medium voltage and low voltage, due to the pending implementing regulations. Regardless of grid integration challenges, opening this market segment will help induce

more renewables' deployment in the country.

- Grid integration: The massive uncontrolled integration of renewables in the grid might impact the safety of the electrical systems. Thus, accurate resource forecasting coupled with developing storage as well as flexible generating units like combined cycle gas power plants would undoubtedly unlock this potential.
- Financing: Benefitting from the momentum created at the international level, especially, by international financial institutions and multilateral development banks, Morocco has been able to attract concessional loans with attractive terms thereby making renewables a viable energy alternative. Still to engage are commercial banks, including local banks, whose implication in financing renewable energy projects is limited.
- Volatility of oil and gas prices and the issue of subsidies: The issue of price volatility could have mixed effects on the energy situation and economy in Morocco. Higher prices at the international markets would mean an upward pressure on fuels-import bills and thus misallocation of resources (increased subsidies, especially for butane gas), and the contrary is true with low prices. Because of the gradual phase out and the liberalization of oil products (i.e. diesel and gasoline), such efforts have fallen short of their expected results, and thus gave way to several boycott movements in the country against rising prices at the pump. The high prices, however, could provide an opportunity to massively develop domestically available sources of energy, mainly solar and wind. In particular, promoting alternatives such as solar PV for water pumping and solar water heaters for water heating could potentially help the country in continuing its subsidy reform efforts.

Embeddedness of the MENA in economic globalization processes

ECKART WOERTZ & IRENE MARTÍNEZ

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Middle East and North Africa (MENA) countries are laggards in terms of trade integration and investment flows. Henry and Springborg and other scholars have pointed out that the MENA region has fallen behind other world regions in the age of globalization, especially emerging markets in Asia, but also in Latin America. This assessment chimes in with the resource curse literature. Economies of resource abundant countries tend to focus on non-tradables as a result of Dutch disease and an effective appreciation of the exchange rate. They also maintain political structures and practices that are hampering economic development, such as resource capture by elites, corruption, rent seeking and educational shortcomings.

An analysis of trade patterns reveals a prevalence of oil and gas exports in many countries of the MENA, while manufactured goods dominate the import side of their balance sheets. Yet there are some striking differences and also evidence of diversification. Gulf countries such as Saudi Arabia, the United Arab Emirates (UAE) and Qatar have built up thriving heavy industries in petrochemicals and aluminum. Dubai has pioneered diversification into trade, logistics, services and tourism and has inspired copycat projects in other Gulf countries, but also beyond, in such unlikely places as the Kurdistan Region of Iraq and Morocco. Morocco has the largest global phosphate reserves. It has moved up the value chain by investing in fertilizer production and other chemical industries, as the Gulf countries have done in the case of petrochemicals. There is considerable light manufacturing in Morocco, Tunisia, Egypt and above all Turkey, ranging from car manufacturing and car supplies to textiles and food processing.

Henry and Springborg observe considerable differences in MENA states' interaction with economic globalization, ranging from "bunker states" that concentrate economic prerogatives in the hands of the state (Algeria, Iraq, Libya, Syria, Sudan and Yemen) and "bully praetorian states" that leave some room for initiative to the private sector and associated rent seeking activities (Egypt, Tunisia and Iran) to the globalizing monarchies in the Gulf, Morocco and Jordan and precarious democracies in Lebanon, Turkey and Israel. The MENA region is more diverse than it often seems. A differentiation according to various levels of resource and labour endowments is necessary, ranging from the resource abundant/ labour poor states

(Gulf Cooperation Council [GCC], Libya) to the resource abundant/ labour abundant ones (Algeria, Iraq, Iran) and the resource poor labour abundant countries (Jordan, Morocco, Tunisia, Lebanon). As mineral production in Syria, Yemen and Sudan has been affected by conflict and maturing oil fields, the status of these countries increasingly resembles that of resourcepoor/ labour-abundant countries, too. Turkey and Israel, the only Organisation for Economic Cooperation and Development (OECD) countries in the region, are set apart by higher incomes and their diversified economic structures. (...)

GLOBAL EMBEDDEDNESS: HEAVY INDUSTRIES (GULF, TURKEY AND MOROCCO)

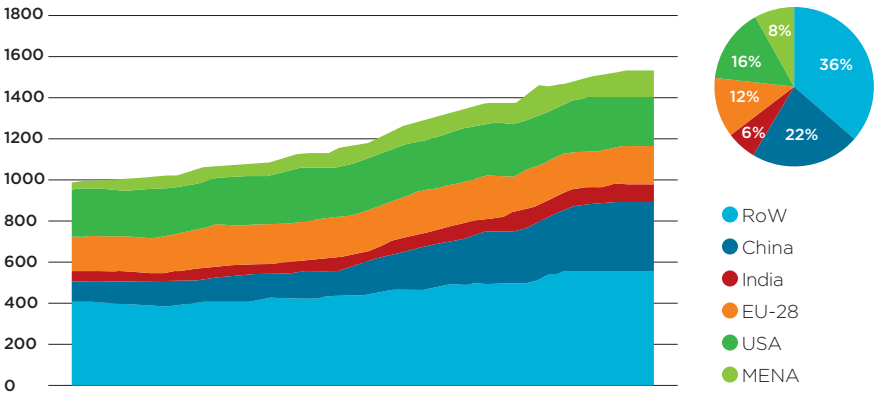
In the 1970s the nationalization of oil industries in the MENA heralded the end of vertically integrated international oil companies. Spot markets for oil and petroleum products developed to mediate between formerly integrated parts of the supply chain. Gulf countries sought to move beyond the upstream sector and enhance the value chain of their oil production by investing in downstream industries and distribution networks. They established major petrochemical companies such as Saudi Arabia's SABIC and the UAE's Borouge. Such companies have undertaken foreign acquisitions and joint ventures. SABIC's takeover of British Huntsman Petrochemicals, US GE Plastics and Dutch DSM and investments of the Abu Dhabi-based International Petroleum Investment Company (IPIC) in Austrian Borealis and Spanish CEPSA are cases in point. Petroleum demand for transport has levelled out or is declining in OECD countries.

It might suffer further with the proliferation of electric mobility, not only in the OECD countries, but also in emerging markets such as China, as some interlocutors of the business community pointed out during our interviews in Kuwait. In contrast, demand for petrochemicals is projected to grow over the coming decades. As their use does not immediately lead to harmful emissions they are not as controversial in climate debates as the burning of hydrocarbons in transport and industry. Hence the diversification strategy into petrochemicals offers longer-term perspectives for the Gulf countries. Saudi Aramco, for example, has sought to integrate refining and petrochemical production more closely with its Rabigh deep conversion refinery that it has built in a joint venture with Japanese Sumitomo.

Since the 1980s there has been a dramatic shift of global petrochemical production capacities from OECD countries to emerging markets, especially the Gulf countries and Asia. OECD countries had a 75 per cent market share in 1980. This share declined to 37 per cent in 2010, while the share of the Middle East and China grew to 13 per cent and 17 per cent respectively. This trend in the Gulf region is buoyed up by access to cheap

feedstock, but also by increasing demand in the region and the proximity to the booming Asian market. The industry has increasingly moved towards more value added and naphta-based production. Natural gas-based ethane is no longer readily available as a result of rising domestic natural gas consumption. This has led to natural gas shortages and import needs in every Gulf country except for Qatar. So far petrochemical growth rates in the Middle East and Asia continue to be stronger than in OECD countries, even after the shale revolution has led to a reinvigoration of the US petrochemical industry in the Gulf of Mexico, as a former Italian energy executive pointed out in our interviews. The concentration of petrochemical industries in the Gulf also offers potential advantages for carbon capture and sequestration, as plants are in close vicinity to oil fields where the injection of carbon dioxide could be used to maintain reservoir pressure.

TOTAL PRIMARY ENERGY DEMAND, BY REGION/COUNTRY



Beyond petrochemicals, other energy-intensive heavy industries have also contributed to economic diversification. The Gulf countries doubled their aluminum production between 2010 and 2017 and are now the second largest producer after China, which dominates global markets with a share of 55 per cent. The UAE, Bahrain and Saudi Arabia are the largest producers, followed by Qatar and Oman; only Kuwait has no aluminum production. Together Gulf countries represent over 8 per cent of global production. They have also reduced their import dependence on steel.

The MENA region is rich in oil and gas, but poor in iron ore, coal and other minerals that have played crucial roles in industrialization processes. To safeguard feedstock supplies Gulf countries have acquired access to mining production of alumina and iron ore in distant places such as Guinea,

India and Mauritania. Turkey has chosen a different approach. It has become the largest global importer of scrap metal to feed its steel industry, which has doubled production since 2004.

The MENA region is an important source of global fertilizer production. It (mainly Israel and Jordan) produces 10 per cent of world potash and nitrogen-based ammonia and 25 per cent of phosphates, a figure that does not even include the recently launched Al-Jalamid project in Saudi Arabia. The dominance of the MENA in the phosphate sector is likely to grow. Morocco alone commands threequarters of global reserves according to the International Fertilizer Development Center and the US Geological Survey (USGS), which have massively upgraded their reserve estimates for the country. Syria, Tunisia, Algeria, Egypt and Saudi Arabia have also significant reserves, and in Iraq's Al Anbar province phosphates amounting to 9 per cent of the global reserve base have been discovered. This makes Iraq the second most resource-rich country after Morocco. MENA's dominance in global phosphate reserves is much more pronounced than its well-reported share of global oil and gas reserves. Phosphorus is an essential macronutrient for fertilizers and, as it is an element, it cannot be substituted, unlike the production of nitrogen fertilizer from natural gas for example. Phosphorus is essential for global food security. Hence the MENA dominance of global phosphate reserves carries longterm strategic implications. As with Gulf petrochemicals, Morocco and Saudi Arabia have sought to enhance the value chain of a primary commodity by moving downstream and producing more value-added products such as fertilizers and phosphoric acid.

The large energy needs of domestic heavy industries contribute to skyrocketing domestic energy consumption in Gulf countries, alongside residential demand. Except for Qatar, all Gulf countries have a natural gas shortage. As a remedy they have recourse to liquified natural gas (LNG) imports or burn fuel and crude oil in power plants. The domestic demand growth threatens to compromise oil exports and revenues. This has led to diversification attempts into renewables and nuclear energy, especially in the UAE and Saudi Arabia. The introduction of these new sources in the local energy mix entails close cooperation with international providers and presents another aspect of integration in economic globalization dynamics.

GLOBAL EMBEDDEDNESS: FINANCE (GULF, LEBANON, MOROCCO, TURKEY)

Until 1975 Lebanon was a major banking hub in the region, but in the wake of Lebanon's civil war and the oil boom, this distinction has passed on to the Gulf countries. Bahrain and the UAE have established bespoke international financial centres to attract business. Qatar has tried to do the same and the formerly closed stock market of Saudi Arabia was opened

to foreign investors in 2015. MSCI upgraded the stock markets of UAE and Qatar in 2013 and included them in its emerging market index. This led to increased interest by international investors, although some of them chose not to invest and allow for the minimal tracking error, given the small share of both countries in the MSCI index, as interlocutors of the Kuwaiti stock exchange pointed out in our interviews.

Globally, financial markets have on average a balanced structure of equity, bond and bank financing. In comparison, MENA financial markets are heavily skewed towards bank financing, with a share of around 60 per cent. Bond markets are especially underdeveloped. While bank financing dominates, access to it depends on political connections. A practice of name lending is widespread. Receiving bank loans can be challenging for small and medium sized enterprises (SMEs).

Bond and equity markets have grown, however. Gulf stock markets have opened up internationally and bonds from the Gulf countries have enjoyed considerable interest from international investors in an environment of low interest rates. Despite these examples of disintermediation, bank lending remains prevalent across the MENA. In Turkey over 90 per cent of financial assets are held by banks. The role of capital markets in Turkey is limited and non-bank financial institutions are underdeveloped, notwithstanding the country's level of economic development and its OECD status. However, in recent years, foreign banks have gained more access to Turkey's financial sector as a result of a series of acquisitions. This limits the risk of market concentration as market power is more evenly distributed between private domestic, foreign-owned and stateowned banks.

Lebanon is a special case, as it relies on capital inflows, mostly from overseas Lebanese and Gulf countries to finance its huge current account deficit. Foreign direct investment (FDI) inflows alone were 5 per cent of gross domestic product (GDP) in 2015 and as high as 12.3 per cent in 2005. Lebanon has a very substantial stock of FDIs compared with its small population and GDP size. The Gulf countries dominate FDI stocks in the region with their capital-intensive projects in heavy industries. Turkey also has high levels, but its stocks have decreased since 2010.

This leading group is followed by Egypt, Lebanon and Morocco. Dubai Islamic Bank was the first modern Islamic bank when it was founded in 1975. Today Islamic banking has developed into an important niche market in the Gulf, which is the largest Islamic banking centre in the world, ahead of Malaysia, Iran and Western Europe. With around 15 per cent annual growth Islamic banking is one of the fastest growing sectors of the industry. This growth comes from a low statistical base and will probably slow down in the future. Yet there is considerable growth momentum today, given the large Muslim populations with growing interest in this kind of banking. Internationalization of the industry, however, is hampered by different na-

tional regulatory standards and divergent views on details of Sharia compliance in key markets such as Malaysia and the Gulf. The closure of HSBC's Islamic banking division Amanah in six key markets, among them Dubai, to where it had moved its headquarters only a few years before, is indicative of limits to growth and profitability in the sector.

The MENA region is rich in oil and gas, but poor in iron ore, coal and other minerals that have played crucial roles in industrialization processes

The term sovereign wealth funds (SWFs) was first coined by Andrew Rozanov in 2005. Since then this type of investor class has witnessed steep growth in the wake of the oil boom of the 2000s and large current account surpluses in Asian exporter nations. However, it still trails far behind the assets of Western banks, pension funds and insurance companies. Apart from Libya all MENA SWFs are located in the Gulf region. Algeria and Iran manage their more modest foreign assets mainly via their respective central banks, as does Saudi Arabia with the Saudi Arabian Monetary Agency. Older and larger funds such as the Abu Dhabi Investment Authority and the Kuwait Investment Authority follow a more passive portfolio investment approach, while others such as Mubadala and the relatively young Qatar Investment Authority undertake strategic investments, can pursue controlling stakes in companies and also invest in private equity.

According to Sovereign Wealth Fund Institute data, the Middle East's SWF assets represented 37 per cent of global SWF assets in 2014. The main recipient of these investments has been the European Union (48 per cent), with about half of that share going to the UK. The US and Asia followed with 16.6 per cent 10.4 per cent respectively. China and Taiwan accounted for over threequarters of the Asian investment share.

Morocco is an interesting case of financial south–south globalization. It has sought to establish itself as an intermediary between Africa and Europe and has strengthened business relations with sub-Saharan Africa (SSA). SSA is the only region of the world with which Morocco has a trade surplus. Moroccan companies have established themselves in strategic sectors such as telecommunication, pharmaceuticals and agro-alimentary industries. Before 2005, Moroccan banks had only a limited presence in SSA, focusing on Guinea, Mali and the Central African Republic. Since then there has been rapid expansion, helped by the retrenchment of French banks in SSA, the increase of trade flows from Morocco to West Africa and the weak activity in the Moroccan domestic market. The overseas expansion of Moroccan banks has relied on the acquisition of local banks, whose local deposits largely fund the newly acquired subsidiaries. The assets of Moroccan banks in SSA typically range between 3 and 7 per cent of host countries' GDP, with the largest concentrations in Senegal, Burkina Faso,

Mali, Niger, Côte d'Ivoire, Benin and Gabon. Morocco's push into SSA has helped Casablanca to become a regional financial centre. In the MENA it is ranked right behind Dubai and Abu Dhabi and ahead of Tel Aviv. Most remarkably, Casablanca is also rated first in Africa, unseating Johannesburg. (...)

GLOBAL EMBEDDEDNESS: LOGISTICS (GULF, EGYPT, MOROCCO, TURKEY)

In terms of logistics five developments in the MENA stand out: (1) The rise of super-connector airlines in the Gulf and Turkey, (2) Morocco's interconnections with SSA, (3) the rise of container traffic in the Gulf, (4) the lasting importance of the Suez Canal and other chokepoints for global trade and (5) Turkey's importance as a gas and trade transit hub.

Gulf airlines are a mixed bag. Many are only of regional importance and can be rather sleepy operations, such as Saudia Airlines, Gulf Air or Kuwait Airways, but the three airlines that have pursued the super-connector business model have developed into major players in global aviation: Emirates Airlines, Qatar Airways and Etihad. Their business strategies aim at becoming transit hubs for the long-haul routes between Europe and Asia. Two billion people live within four hours' flying time from the Gulf and twice as many within seven hours.

Since 2006, Emirates Airlines has tripled its passenger numbers and Etihad and Qatar Airways have seen even steeper growth. The Middle East had a 9.6 per cent share of the international passengers market in 2016. Gulf airlines lead global aviation growth, both in terms of new airline capacity and revenue passenger kilometers, a measure that reflects how many of an airline's available seats were actually sold. The average age of their fleets (5.4–6.4 years) is less than half that of their American and European competitors and the three super connector airlines constantly rank among the top ten airlines in global rankings. The sector is crucial for economic diversification and feeds other related sectors, such as tourism and trade services. A study by Oxford Economics in 2014 quantified the direct and indirect contribution of aviation to Dubai's GDP at 26.7 per cent of GDP and 21 per cent of employment. Turkish Airlines, too, has adopted the super- connector model. Like the Gulf airlines it seeks to conquer market share in transit traffic between Europe and Asia. With many exotic destinations in Central Asia and Africa it is now the airline with most destinations globally. Its passenger numbers skyrocketed within a decade from 17 million in 2006 to 61 million in 2015.

The regional competition between the super-connector airlines has raised questions about their long-term growth prospects. It has been doubted whether Qatar Airways is in fact profitable and there have been reports about a possible merger between Emirates and the smaller Etihad that

the companies denied. Established airlines in the US and Europe that have been ruffled by the Gulf carriers' success have blamed them for thriving on fuel subsidies, low wages and unfair labour practices and have lobbied their governments to undertake protectionist and retaliatory measures. The Gulf carriers have denied such accusations but clearly feel the political headwinds. More danger could come from the economic front: with growth in global aviation it becomes increasingly profitable to provide direct connections between smaller destinations, making the whole super-connector model potentially superfluous. Many of the new plane orders of airlines now encompass planes for such medium sized connections, rather than huge airplanes for super-connections such as the Airbus 380 or the Boeing Dreamliner. Airlines that are domiciled in countries with large domestic markets in Europe, North America and Asia also have entered a number of alliances that could threaten the Gulf airlines that are domiciled in city states without such domestic market advantages.

MENA financial markets are heavily skewed towards bank financing, with a share of around 60 per cent. Bond markets are especially underdeveloped

Super-connectors apart, Morocco increased its air traffic by 160 per cent in the wake of the EU-Morocco open skies agreement of 2006 and has become a regional hub for air traffic in Africa. The national air carrier, Royal Air Maroc (RAM), developed its network of African flight destinations from six in 2003 to 30 in 2014 and from these 30 cities there are 45 more connections to other countries in Africa, making Morocco a hub between Africa and Europe and attracting logistics companies such as DHL. Currently 55 per cent of RAM's destinations are to African countries and they provide 25 per cent of the company's turnover. Apart from its geographical location fertilizer exports are a major reason for Morocco's interest in Africa as the representative of a Moroccan research institute pointed out in one of our interviews. African fertilizer usage per hectare trails way behind other world regions. The continent will need to use more fertilizer to increase agricultural production and feed its rapidly growing population. The state-owned phosphate company OCP launched a bespoke subsidiary for Africa in 2016. It hopes to replicate the steep growth of its fertilizer exports to other agricultural producers such as Brazil and India.

Led by Jebel Ali Port in Dubai, some Gulf countries have developed into major shipping hubs, especially for container traffic. Jebel Ali is a primary entry point to the Gulf and the wider MENA market. Other significant ports include Jeddah, on Saudi Arabia's Red Sea coast and Khor Fakkan on UAE's coast with the Indian Ocean. Sharjah, the neighbouring emirate of Dubai, also has a large harbour. In 2015, Jebel Ali was the world's ninth busiest container port with 15.6 million TEU, only surpassed by Singapore

and Chinese ports and ahead of European ports such as Rotterdam, Antwerp, Hamburg and Valencia, which were more important operators only a decade ago. With the completion of the East–West railway line in Saudi Arabia, over time Jeddah may be able to compete more efficiently with Jebel Ali. Currently Jeddah ranks 36th world wide in terms of container volume (4.2 million TEU), Port Said in Egypt 41st (3.6 million TEU) and Sharjah in the UAE 44th (3.4 million TEU).

When the Suez Canal was completed in 1869 it revolutionized global trade by cutting the distance between Europe and Asia by 43 per cent. For Egypt it is a major source of hard currency revenues and a catalyst for FDI in sectors and economic zones that develop around it. Around 10 per cent of the world's shipping traffic and 22 per cent of its container traffic passes through the canal. The same is true for 5.6 per cent of global oil and petroleum product supplies, which is equivalent to 9.2 per cent of the world's maritime oil traffic.

Due to its strategic location, the Suez Canal has become one of the world's most important chokepoints for food and oil trade. A recent report by Chatham House highlights its importance for trade between Europe and several Asian economies. One-third of South Korea's wheat and maize is imported via the Suez Canal and MENA wheat imports that pass through the canal grew by 120 per cent between 2000 and 2015. The Suez Canal also forms part of one of China's One Belt One Road maritime routes. There are only limited alternatives as the detour around the Cape of Good Hope is time- and fuel-consuming and thus expensive. The Netherlands and the Mediterranean countries of Europe also rely heavily on trade via the canal.

The New Suez Canal is expected to increase direct revenues from shipping, but world trade figures are still sluggish and falling oil prices have made it more attractive for some ships to take the detour via the Cape to avoid the canal's hefty transit fees. To increase the economic impact of the canal, Egyptian authorities are initiating new economic zones, factories and logistics facilities around it.

With the Blue Stream pipeline Turkey has developed into an important destination for Russian gas. The expected completion of the Trans-Adriatic pipeline in 2020 and possible future pipeline projects could transform Turkey into a gas trading hub between Russia, Central Asia and Europe. Middle Eastern gas from Iran, Iraq and the Levant could also be fed into the Turkish transit system, depending on the development of reservoirs, international agreements and the security situation. If the abandoned South Stream pipeline project via the Black Sea to Bulgaria is replaced with a successor project, Russian gas transits to Europe via Turkey could also increase. Such a successor project is currently being discussed between Turkey and Russia. Via the Strait of Bosporus Turkey is also the primary ac-

cess point for trade from the Black Sea region, most notably the substantial wheat and barley exports of Russia and Ukraine that have superseded European and US exports in recent years. (...)

GLOBAL EMBEDDEDNESS: AGRICULTURAL AND FOOD TRADE (ALL MENA)

The MENA region is the world's largest net importer of cereals. Its agricultural production cannot be increased substantially for lack of water and arable land, while its population growth will only level out after 2050. The reliance on food imports will persist and even grow, especially for water intensive cereals and fodder products. The widespread rhetoric of self-sufficiency and efforts to increase cereal production are not sufficient to counter this trend. In many cases such efforts will fall short for lack of the necessary natural resource endowments. Saudi Arabia actually phased out its wheat production between 2008 and 2015.

This import dependence is perceived as a strategic liability by MENA countries, especially at times of conflict or market turbulence. This was the case in the wake of the global food crisis of 2007/2008 when agricultural exporter nations such as Argentina, India, Vietnam and Russia declared export restrictions out of concern for their own food security. Beside the traditional grain exporter countries (North America, Eurasia, Argentina and Australia), tropical countries such as Brazil (poultry, corn and soybeans), Malaysia and Indonesia (palm oil) and rice exporters such as Pakistan, India and Thailand have gained increased prominence over the past two decades.

To ameliorate concerns about import dependency the cash-rich oil exporters among the MENA countries announced agricultural investments abroad in the wake of the global food crisis of 2007/2008. They hoped to gain privileged bilateral access to food production, often in food insecure countries such as Sudan or Pakistan. Actual implementation of such controversial projects has fallen short of the media announcements. Many projects were not launched at all or only at a fraction of the announced scale. When the Gulf countries actually put money on the table it was rather for established agricultural export nations such as Australia or Argentina and in the downstream sectors of food processing and distribution. Saudi state-owned SALIC, for example, joined forces with international grain trader Bunge in 2015 and took over a majority stake in the former Canadian Wheat Board when it was privatized. The upstream acquisition of farmland was less interesting by comparison, as it is politically controversial and economically challenging in many developing countries.

Beside the deep integration of MENA countries in global food and cereal markets via the import side, some of them are also major exporters

of fruit and vegetables. Turkey and Morocco are the only MENA countries that have an agricultural trade surplus in value terms. Like the other MENA countries they are cereal net importers, but export other foodstuffs. Turkey is the seventh largest agricultural economy globally. It is the world's biggest producer of hazelnuts, apricots, figs, cherries, quinces, raisins and poppy seeds, the second largest producer of melons, watermelons, strawberries and leeks and the third largest of lentils, apples, cucumbers, green beans, green peppers, chestnuts and pistachios. Morocco, Tunisia and Egypt are also substantial exporters of fruit and vegetables to the EU. Morocco is also one of the world's largest producers of strawberries. Tunisia increasingly manages to develop direct marketing channels for its olives, instead of wholesaling them to Italian olive oil producers. Despite considerable trade liberalization with the EU, quantitative restrictions for some agricultural products remain in place. MENA producers also struggle with EU food safety standards that have to be overcome to access European markets. In our interviews a Kuwaiti investment official was skeptical whether Morocco and Tunisia would be able to grow their agricultural production without better water management because of growing water scarcity. He also questioned whether the North African countries had benefitted as much from their improved market access to the EU as initially expected.

The Middle East had a 9.6 per cent share of the international passengers market in 2016. Gulf airlines lead global aviation growth, both in terms of new airline capacity and revenue passenger kilometers

Future challenges of climate change in the MENA region

EDGAR GÖLL

MENARA Future Notes, No. 7. (2017)

Since the 1980s, scientific research on climate change has emphasized that the changes anticipated will have major impacts on and consequences for all world regions. Within the field of scientific future research and future studies climate change is therefore acknowledged to be one of the major "megatrends". (...) Through interaction with other megatrends and changes, such as demographic change, globalization and urbanization, climate change will very likely pose huge challenges for countries within the MENA region.

The MENA region will be one of those most severely affected by ongoing climate changes. These will be caused by increased average temperatures, less and more erratic precipitation, changing patterns of rainfall, continuing sea-level rise and changes in water supply. All this will happen in a region which already suffers from aridity, recurrent drought and water scarcity. Climate change in the MENA region is expected to affect water resources, sea level, biodiversity, human health, food production, land use and urban planning, and tourism. Each of these threats poses extraordinary challenges for governance and development and calls for major efforts to lessen their negative and dangerous effects.

Water resources in the MENA region are diminishing. Water scarcity is already critical in several areas and will reach severe levels within the MENA region by 2025 (...). Man-made changes are making the situation worse. For example, the widespread construction of dams and unsustainable irrigation practices (which waste about half of the water resources) and high rates of human water consumption (which are well above international standards in some Arab countries) are contributing to making this problem even more acute (...). Another major challenge for parts of the MENA region is sea level rise, because most of the region's economic activities, agriculture and population centres are located in coastal areas. The high vulnerability of coastal areas to sea level rise results from inundation and the increasing salinity of the soil, coupled with the reduced availability of freshwater resources such as aquifers. Overall, sea level rise of 1 metre would directly impact 41,500 km2 of MENA coastal lands. The most serious impacts of this can be expected in Egypt, Tunisia, Morocco, Algeria, Kuwait, Qatar, Bahrain and the UAE. For example, the effects for

Egypt of a sea level rise of 1 metre – which is likely to occur by the end of the century – would mean that more than 6 million citizens have to be moved elsewhere with all their belongings and the whole infrastructure, and that 4,500 km2 of precious agricultural land would be lost. (...)

sea level rise of 1 metre would directly impact 41,500 km2 of MENA coastal lands. The most serious impacts of this can be expected in Egypt, Tunisia, Morocco, Algeria, Kuwait, Qatar, Bahrain and the UAE

In the region biodiversity is already deteriorating, and it will be further damaged by intensifying climate change. A 2°C rise in temperature will make extinct up to 40 percent of all existing species in the region. (...) Human health will also be negatively affected by increasing temperatures in the region, mainly owing to changes in geographical distribution of disease vectors such as mosquitoes, waterborne pathogens, water quality and air quality, as well as food availability and quality. It is very likely that cases of infectious diseases such as malaria will increase, mainly in Egypt, Morocco and Sudan. Malaria, which already affects 3 million people annually in the region, will become more prevalent and will affect new territories as higher temperatures reduce the incubation period, spread the range of malaria-bearing mosquitoes and increase their abundance. (...)

So far, land use and urban planning regulations in the MENA region largely ignore basic adaptation requirements to climate change. An estimated 75 percent of buildings and infrastructure in the region are at direct risk of climate change impacts, mainly from sea level rise, higher intensity and frequency of hot days and storm surges. Reliability of transportation systems, energy generation stations, water supply and waste-water networks will be at risk. (...)

As an important sector of the economy for a number of MENA countries, tourism is highly vulnerable to climate change. An increase of 1–4°C in average temperature will cause a drastic decline in the index of tourism comfort all over the region. Areas classified between "good" and "excellent" are likely to become "marginal" to "unfavourable" by the year 2080, mainly because of hotter summers, extreme weather events, water scarcity and ecosystems degradation. In addition, phenomena such as the bleaching of coral reefs will affect tourism in countries in the Red Sea basin, mainly Egypt and Jordan. Beach erosion and sea level rise will affect coastal tourist destinations, mainly in Egypt, Tunisia, Morocco, Syria, Jordan and Lebanon, especially in locations where sandy beach stretches are narrow and buildings are close to the shoreline. To counter this, options for "alternative tourism" which is less vulnerable to climatic variability, such as cultural tourism, should be explored.

DANGEROUS DEFICITS IN THE PREPARATION FOR CLIMATE CHANGE

There has not been much effort made to prepare the MENA countries for these climate change challenges. For example, no systematic data gathering and research efforts seem to exist regarding the impacts of climate change on health, infrastructure, biodiversity, tourism, water and food production. Reliable records of climate patterns in the region barely exist. The economic impact seems to have been totally ignored, despite the prognosis that the later climate policies are adopted, the costlier the necessary investments will be. In sum, with regard to mitigation or adaptation for climate change, the policy-making of most governments in the region has shown dangerous deficiencies that need to be urgently remedied. Many arenas of governance – from sustainable management of natural resources and monitoring development to risk planning and evaluation of activities – have to be rapidly created. This is badly needed, since almost all countries in the MENA region are among the most vulnerable in the world with regard to the likely impacts of climate change, as previously stated. In addition, latest research suggests that there may be dangerous tipping points. Among these is the further expansion of the Sahara Desert and the further deterioration of the natural environment in Sahel.

How can renewable energy help contribute to the development of the MENA countries?

EMANUELA MENICHETTI & ABDELGHANI EL GHARRAS

MENARA Future Notes, No. 6. (2017)

The MENA countries accounted for around 7.4 percent of the world's total population (545 million inhabitants) in 2015. This is expected to change slightly by 2040, with an additional 213 million inhabitants by that date, which would put an upward pressure on energy demand and thus more, greenhouse gas emissions (GHG) if this demand is to be met through fossil fuel resources, which currently dominate the energy mix in the MENA countries.

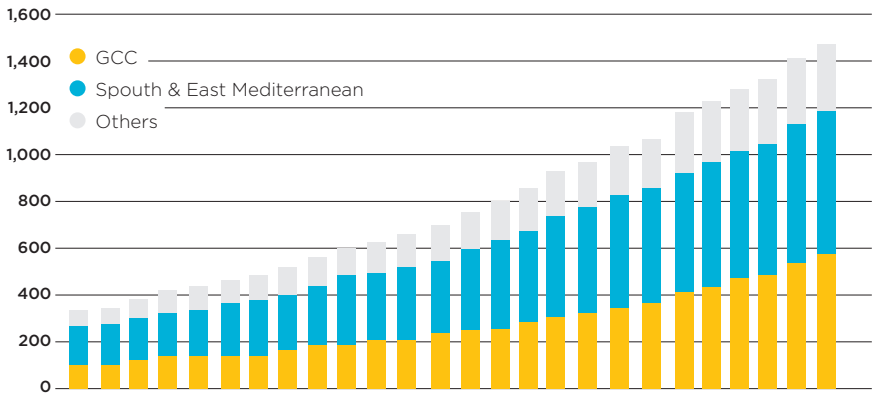
Countries in the MENA region can be classified into two main categories: net energy importers and net energy exporters. All South and East Mediterranean countries, with the exceptions of Algeria and Libya, are net energy importers. In Jordan, Lebanon and Morocco the dependence rate on foreign resources is more than 90 percent. Conversely, all Gulf Cooperation Council (GCC) countries, Iran and Iraq are energy-exporting countries, in addition to Algeria and Libya, as mentioned above. In terms of fossil fuel reserves, the MENA countries were host to 51.2 percent (869 billion barrels of oil) of global oil proved reserves in 2015, and 47 percent (around 88 trillion cubic meters) of world gas proved reserves. The region also accounted for around 8 percent of global total primary energy supply (1,074 million tons of oil equivalent, Mtoe) in 2014.

Accounting for around 29 percent (more than 622 Mtoe) of total energy production in the region, Saudi Arabia heads the region as the leading energy exporting country, with more than 405 Mtoe (65 percent of domestic energy production) in 2014. Relatively speaking, Qatar and Kuwait export around 80 percent of their domestic energy production and Iraq almost 70 percent. However, such trends are expected to drastically change in the near future, if energy consumption continues at its present rate, leading to reduced export capacities in order to meet the increasing domestic demand.

The energy mix in the MENA countries is heavily dependent on fossil fuels. This is especially true for the energy exporting countries, with very low penetration of renewable energy sources. On the contrary, renewables are

mostly developed in energy-importing countries. Historically, hydropower has been the most dominant source. Other renewable energy sources, mainly wind and solar, have experienced significant progress, reaching more than 21 Mtoe in 2014 in South and East Mediterranean countries. In terms of the share in electricity production, Turkey leads the region with 21 percent, followed by Syria (17 percent), Morocco (14 percent), Egypt, (8 percent), Palestine (8 percent) and Tunisia (7 percent). In the whole region, around 11 GW of installed capacity are in place, distributed as follows: wind (7.5 GW), solar photovoltaic (PV) (1.7 GW), geothermal (775 MW), biomass and waste (650 MW) and concentrated solar power (CSP) (347 MW).

GRAPH ENERGY CONSUMPTION TWH



The region is well suited for the development of renewable energy technologies for different applications. As far as solar energy technologies are concerned, most of the countries lie in the so-called Sunbelt, with global horizontal irradiance (GHI) values ranging from 1,600 kWh/m^2/y in coastal areas of the Mediterranean to 2,600 kWh/m^2/y in the desert, and direct normal irradiance (DNI) varying from 1,800 kWh/m^2/y to more than 2,800 kWh/m^2/y. This is one of the best areas of the world in terms of solar energy, both for PV and CSP applications. The potential for wind is also very high in several countries of the Mediterranean, such as Morocco, Egypt and Turkey, as well as Iran, with more moderate – but still interesting – potential in GCC countries and Iraq.

At present, several barriers hold back the potential of renewables in the MENA countries, including weak grid infrastructure, regulatory barriers, access to finance and, most important, subsidies for conventional energy. Almost all countries provide some kind of energy subsidies, which are reflected in the final consumer prices for energy products and ser-

vices. The highest amounts of energy subsidies are in the energy-exporting countries. In the GCC, for example, the low penetration of renewable energy technologies could be attributed to "institutional inertia faced with new markets, clarity in institutional roles and responsibilities, and lack of dedicated policies and regulations". Nevertheless, plans are ongoing in almost all MENA countries, although with different implementation speeds. Almost all countries have set up ambitious objectives and plans for the development and deployment of renewable energy either in the energy mix or in electricity production. Government-backed tenders in particular have resulted in some of the most cost effective projects at world level for solar and wind, with record low prices in Morocco and the UAE.

Based on the targets announced, the total installed capacity from non-hydro renewable energy sources would stand at more than 192 GW by 2030, thus representing seventeen times growth compared to current levels. By technology, solar PV is expected to have an important role in the electricity mix, with more than 42 percent of installed electric capacity, followed by wind (around 35 percent), solar CSP (around 19 percent), and then biomass and waste (3 percent) and geothermal (less than 1 percent).

POTENTIAL BENEFITS OF RENEWABLES IN THE REGION

(...) The potential benefits of implementing the national renewable energy targets are estimated based on the difference between the net benefits of renewables in 2030 compared with 2016 as the reference year. The benefits take into account renewables installed as of 2016. Hydro power is excluded from the calculations.

- ***Energy savings***: Potential average annual energy savings are estimated at 90 Mtoe, reaching an accumulated saving of 1,120 Mtoe – equivalent to slightly higher than the total primary energy supply in 2014 of the whole region – during the 2017–30 period. Realizing the opportunity cost of saving fossil fuels and directing part of their renewables to export (especially for GCC countries) is one of the potential benefits that some countries could reap from deploying renewable energy.
- ***Avoided CO2 emissions***: Provided that the countries meet their renewable energy targets, O2 around 84 and 428 Mt of CO2 emissions could be avoided in 2020 and 2030 respectively. The total accumulated savings are estimated at around 2.8 Gigatons of CO2 (GtCO2) – equivalent to more than 1.1 times the total CO2 emissions of the whole MENA region in 2014. The use of energy is the largest source of greenhouse gas emissions (GHG) in the world (68 percent of the total). The electricity and heat production sector is, by far, the largest CO2 emitting sector, accounting for 42 percent of total CO2 emissions from fossil fuel combustion in the world in 2014 (32 GtCO2). Two countries in the region,

Saudi Arabia (tenth) and Iran (eighth), were among the top ten CO2 emitting countries in the world in 2014. Therefore, an increasing energy demand that is fuelled with a business as usual scenario, to be met through fossil fuels, is unsustainable and will contribute to an upward trend in CO2 emissions.

- ***Job creation***: Achieving these objectives could generate on average more than 280,000 direct jobs per year. The total number could reach more than 430,000 by 2030. Most of these jobs will be concentrated in countries with the highest renewable energy objectives in absolute terms and where a potential manufacturing industry could emerge, mainly in Saudi Arabia, UAE, Turkey, Egypt, Algeria and Morocco. Solar PV, wind and CSP would account for the largest share of the jobs by 2030, 41 percent, 28 percent and 22 percent, respectively. The national renewable energy projects could therefore potentially generate an important number of jobs, which are much needed in the region to absorb a portion of the increasingly unemployed populations.
- ***Creation of a local industry value chain***: in the MENA region, several countries have adopted such a policy by including local content requirements in auctioning. In the South Mediterranean, for example, and notably in Morocco, local requirements have been important in determining winners. Even though this is at a very early stage, realizing the national plans could create a local industry that can be actively involved in the development of renewable energy projects. Albeit with different stages of local industry integration in renewable energy projects from country to country and from one technology to another, some of the local stakeholders have already been involved in the implementation of renewable energy projects.
- ***International cooperation***: international partnerships seem to be key in developing renewable energy projects in the region. Large-scale projects are implemented by consortia of local and foreign developers and engineering, procurement and construction (EPC) companies. Of note is the design of the tendering schemes that are being used by some countries and which others might adopt in the future, especially by integrating local content clauses for a given share of local added value in projects, could eventually contribute to the creation of a local industry across the whole region.
- ***Energy access***: in the MENA region, more than 45 million inhabitants are still without electricity access. Electricity rates are low in the following countries: Mauritania (29 percent), Sudan (40 percent) and Yemen (46 percent). Whether they could gradually substitute diesel generating units in remote areas in countries with already 100 percent electrification rates, decentralized renewable energy generation, especially through PV, could be key in filling this gap, especially in the countries where electrification rates are still low.

Demographic and economic material factors in the MENA region

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DEMOGRAPHIC FACTORS: EMERGING TRENDS

From the 1950s, many states across the region have pursued state-led models of development, supported by substantial public investment and often populist social policies. State efforts to extend social welfare provisions, improved per capita physician ratios and life-expectancy, and declining maternal and infant mortality rates helped lead to half a century of rapid population expansion. Other countries, such as Israel and the Gulf states, saw rapid rates of migration from within the region and from Europe, North America and South Asia. However, from the mid-1960s, most countries across the region went through a "demographic transition", where TFR began to decline, in part related to increased levels of education, family planning, urbanisation and shifting patterns of migration.

The total population of the MENA region has increased fivefold since the 1950s, from just under 110 million in 1950 to 569 million in 2017. Despite generally declining rates of fertility (discussed below), absolute population numbers are expected to further double to over 1 billion inhabitants by 2100, according to medium variant projections. By the end of the century, therefore, there will be more people in the MENA region than in China, whose population is expected to continue to shrink to just over 1 billion; and more than in Europe, the population of which is expected to recede by approximately 10 percent by 2100.

The largest absolute contribution to the regional increases in population will come from countries that are already experiencing demographic transitions to varying degrees. Egypt, Iraq and Sudan will continue to be prominent population centres across the region, despite a declining TFR. This effect – of increasing absolute population, despite declining rates of fertility –is due to population momentum, which is generated by the high proportion of women of childbearing age – even whilst the number of child births per woman has declined considerably. For example, although family

planning policies have by and large been considered successful in Egypt – with fertility rates declining from five children per woman in 1982 to just over three in 2002 – the population momentum has meant that Egypt's total population tally has continued to increase dramatically and the TFR has started rising again since 2000. Today, Egypt's population already exceeds 97 million, and will remain the most populous country in the region in 2050 with some 154 million inhabitants. Accordingly, Egypt, Iraq and Sudan will become increasingly prominent population centres across the region, in comparison with Turkey, Iran and Morocco for instance, which have lower fertility rates, or smaller nations in the region, such as Mauritania and Yemen, which currently have the highest fertility rates in the region. Egypt, Iraq and Sudan are expected to house 49 percent of the region's total population by 2100 – 199 million, 156 million and 137 million respectively, in comparison to just over 31 percent currently. Together with Syria and Turkey, more than 60 percent of the region's populations will be dependent upon the Nile, Euphrates and Tigris river basins by 2100, compared with 48 percent today. This increased dependence on international rivers, often as downstream riparians, will have significant implications for the viability of supporting the likely increases in agricultural, industrial and municipal water demands, impacting transboundary governance, rural livelihoods and regional food security. Within these absolute increases in population, transitions are also anticipated in the sex ratio and age-specific ratios, which will further influence the implications of these increases.

Exploring total populations by sex reveals that the female population of 54 million in 1950 rose to 277 million by 2017, and is expected to increase further to 504 million by 2100. The male population has increased from 55 million in 1950 to 292 million by 2017, reaching 514 million males by 2100. The male population is thus marginally higher, with a gender ratio of roughly 51 percent male and 49 percent female, more than would naturally occur. Figure 4 shows a general increase in the ratio of males per 100 females in the Gulf countries. Economic migration to the oil-producing Gulf states has had a discernible impact on gender ratios within the sub-region, especially from the late 1970s and with a significant increase since the oil boom of the 2000s.

Return migration from outside the region has also been identified as one of the plausible factors contributing to this trend. In addition to the economic opportunities presented by the oil boom of the 2000s, greater travel restrictions from the region to Organisation for Economic Co-operation and Development (OECD) countries following the 2001 attacks on the World Trade Centre in New York are understood to have been followed by native Arabs returning to the MENA region. Projections beyond 2017 would indicate a decline in the male skewed sex ratio between 2010 and 2100 as inward migration of expatriate male labour force is expected to

slow. In part, this downturn in male migration workers bound for Gulf Co-operation Council (GCC) countries, and the subsequent impact on the sex ratio, is understood to be a consequence of lower oil prices and the associated economic impacts. Combined with this, the increased effort to diversify GCC economies away from petro-chemical and industrial to service sectors, and national programmes focusing on encouraging native labour force growth, are expected to further dampen rates of inward migration.

Despite these higher ratios among mostly GCC countries, across the region as a whole, the birth rates of female and male populations between 1950 and 2016 reflected those of the total population. The ratio of male survivors to females above the age of retirement for the region has continued to decrease since 1980, partly owing to the high male death tolls of the Iran–Iraq War (1980–8), the First Gulf War and other conflicts across the region. While age-specific sex ratios appear relatively stable below twenty-five years of age, for age groups above sixty-nine years old these ratios diverge sharply. The recent conflict in Syria, however, has seen an eight-year reduction in life expectancy for men relative to a reduction of just over one year for women. This trend of fewer men surviving to older age than women implies that greater numbers of women are likely to be widowed or simply have proportionally higher levels of dependency among the older age categories than men. (…)

YOUTH BULGES AND LABOUR MARKET

With the rapid increase in total populations since the 1950s, the MENA region has experienced an exceptional "youth bulge". As a result of declining fertility, the youth bulge peaked in North Africa in the 1970s and in the Middle East in the 1990s, still the relative size of youth in the overall population remains high for the foreseeable future. The Arab Human Development Report of 2016 was specifically devoted to the role of youth in current Arab societies.

It concluded that the current Arab youth population is "the largest, the most well educated and the most highly urbanised in the history of the Arab region". In 2015, almost half of the total population were under the age of twenty-four, and more than 60 percent under thirty years old. Despite this trend, large youth populations present particular challenges in developing countries. Correlations between youth unemployment rates, conflict and civil unrest have been drawn, particularly in developing countries where the capacity to generate educational and employment opportunities and avenues for political participation are limited. Education rates improve the potential for inclusion in "legitimate" labour market activity, whilst "incapacitating" youth from engaging in unlawful activity. (…) However, of those under thirty involved in the Arab uprisings that swept across the region

in 2011, better educated youth were more likely to participate in protests than the unemployed, as feelings of relative deprivation were particularly prevalent in this demographic subset. Youth unemployment, youth bulges and education were identified as critical contributing factors leading to the Arab uprisings. Conflict-stricken countries in the region, such as Yemen, Syria and Iraq, are expected to continue to hold large youth populations. Iran, Turkey, Tunisia, Lebanon, Saudi Arabia and Egypt will instead see their youth as a share of total populations decline at a faster rate, not least owing to faster-ageing populations.

In 2015, almost half of the total population were under the age of twenty-four, and more than 60 percent under thirty years old

Poorly functioning labour markets and the absence of lawful economic opportunities are likely to make illicit, informal economic activities more attractive. While youth unemployment rates are universally higher than the average unemployment rates of many world regions, the MENA region has significantly higher and indeed widening levels of youth unemployment rates. Similarly, whereas education is seen to contribute positively to the likelihood of employment the world over, the MENA region is distinguished in that those who have obtained higher levels of education face similar levels of unemployment as less-educated people. Effectively mobilizing the increased size of this rapidly expanding labour force is a critical component in determining the broader social implications of population growth across the region, and capturing the potential demographic dividend. Issues of youth unemployment may also more significantly affect countries already afflicted by social conflicts. The character of youth transitions from education to employment, from dependants to heads of households, will be determined by government capacities to provide relevant, quality education and vocational training, health and reproductive health services, and social protection products such as unemployment insurance schemes and income support. And as youth proportions begin to decline across the region, the successful engagement of the youth population in gainful employment will become increasingly important in preparation for demographic ageing. (...)

TRANSITIONAL ANALYSIS

It is important to understand that the MENA region is undergoing highly significant population transitions. The dynamics of demographic transition under way across the region vary, in part owing to changing fertility, mortality and migration statistics – in turn all influenced by the range of social factors that are discussed in this section.

As mentioned previously, despite continued growth in absolute population size, the number of child births per fertile woman have in fact transitioned to a downward trend since the midtwentieth century. (...) Iraq, Palestine, Sudan, Yemen and Mauritania still have high TFRs, relative to other MENA states. There are several social factors influencing fertility rates, to varying degrees across different parts of the region. Of these factors, access to education (particularly for women), contraception and urbanisation are considered to have played key roles in informing TFRs. Increased equal access to education for women correlates with declining fertility rates by increasingly delaying the age many women are married and thus shortening the number of childbearing years and total births.

It has traditionally been understood that greater education and cultural awareness of issues surrounding reproductive health and contraception has been hindered across the region owing to a reluctance towards state intervention in family planning, and social taboos and values. The variegated success of local policymakers in attending to public concerns through community outreach and public discourse has affected the rate of demographic transition of MENA countries differently. The example of Tunisia, for instance, which has shown a greater openness towards providing family planning services for unmarried couples, differs from the case of Iran and Egypt.

In addition to family planning campaigns, fertility rates have also been affected in countries in the region as a result of increased public awareness around reproductive health and infection rates of communicable diseases. In Iran and other Gulf states, the HIV/AIDS pandemic that has increasingly begun to affect communities across the region since 2001 has helped shift public receptiveness to reproductive health issues featuring in public policy. Such transitions accompanied the increased success of international organisations in delivering effective support, training and family planning services across the region. With greater support and funding for female outreach workers, birth control and rural health clinics and education, rates of fertility have continued to slow across the core population centres of the region.

The regrowth of fertility rates across several MENA countries has been influenced by divergent factors. In Egypt, a strong commitment to the expansion of family planning services to rural areas and educational programmes around reproductive health led to a dramatic decline in TFRs, from five children per woman in 1982, to 3.5 in the 1990s, and further still to just over three by 2002. Since 2005, however, fertility rates increased to more than 3.5 births per woman in 2016, attributable to the deterioration of national family planning efforts of the 1990s. In Israel, government has long supported population growth, not only through incentivizing inbound Jewish migration and Israeli emigrant repatriation, and offering state ben-

efits to mothers, such as free education and child allowances, but also by heavily funding fertility treatment. Such support has been influenced by, amongst other things, debates around religious imperatives and concerns over high fertility rates among the local Arab population. Iran and Turkey are also actively promoting pro-natal policies, after recognizing the future implications of dramatically declining TFRs for ageing populations and the shrinking labour market available to support them, although these policy efforts are yet to reflect in national TFRs. Rather than reflecting transitions in fertility, absolute population increases in Lebanon and Jordan are more a result of forced migration due to regional conflict. The TFRs of Yemen and Palestine have begun to decline much later than fertility transitions experienced across the rest of the region, at rates reflecting broader regional trends from 1950. (...)

ECONOMIC FACTORS: REGIONAL OVERVIEW

Since population growth is dramatically changing the region, one of the most pressing challenges for internal and external policymakers is to address economic opportunities and risks. The economic challenges in the region have been described as full of "superlatives" because "its workforce has grown at the fastest annual rate in the world (2.7% in the past 10 years)" and youth unemployment is also the highest in the world standing "at around 25% of the population".

Thanks to a century of exploiting hydrocarbons as its primary asset, the region has seen significant economic development. At the same time hydrocarbons have led to a "rentier state" economic model in large parts of the region. In this system, the economy relies mostly on external rents such as oil and gas revenues as opposed to a strong domestic productive sector. Another feature is that only a small number of the working population is needed to generate rents. Government plays the key role in distributing these external rents, allowing little room for a private sector to thrive. Rents derived from energy exports are used to subsidize food, energy and medical services to a varying degree across the region. The key rentier states are Saudi Arabia, Oman, United Arab Emirates, Kuwait, Iraq, Qatar, Bahrain, Libya and Algeria, because they possess the largest hydrocarbon endowment. However, even in countries without much in the way of resources such as Syria, Egypt or Lebanon, the effect of the rentier states in the GCC has been felt, owing to remittances. This model also impacts on the dynamism of economies, which are effectively run by the older generation since few people in the economy are needed to maintain this system. As a result of this system, youth inclusion in economic and political activity is low, and this is one of the most significant challenges in the contemporary MENA region. (...)

THE MENA LABOUR MARKET

The labour markets of the MENA region can be best defined by distinguishing those of Qatar, Kuwait, UAE and Bahrain on the one hand, and the rest of the MENA region on the other. While the GCC economies (excluding Oman and Saudi Arabia) are notable exceptions, with low unemployment of both overall population and the youth, the labour markets in all other countries have in common the fact that unemployment among young people is almost double that of the rest of the population. Arab labour markets in particular (except for the aforementioned) have several distinct characteristics: first, a growing gap between the formal and informal labour market; second, a high reliance on the public sector in the formal labour market for secure job creation, which has resulted in an oversised public sector; third, high youth unemployment; fourth weak private sectors; fifth, low and stagnant female labour force inclusion; and sixth, "a rapidly growing but highly distorted educational attainment" with an underrepresentation of Science, Technology, Engineering and Mathematics (STEM subjects) among graduates. Desirable jobs in the MENA region are those that provide protection and employment stability or high incomes. However, for job seekers to obtain such jobs does not reflect effort or merit through, for example education and experience, but instead it reflects circumstances over which job seekers have less or no control. These circumstances include gender, location, family connections and parents' education. The resulting unemployment owing to these institutionalized inequalities has been identified as a "thorny issue" for the entire region.

The average unemployment rate for all age groups in MENA countries was at 14.5 percent in 2016. In terms of unemployment, the region is as diverse as it is in terms of GDP. First, unemployment differs among age groups. This unemployment rate across the different age groups provides a more insightful picture of unemployment trends. Figure 15 shows the distribution of the unemployment rate amongst all age groups. The International Labour Organisation uses fifteen years of age and above to identify the working age population, as this is the common age threshold used for this purpose in many countries. While average unemployment rate among above fifteenyear-olds is around 10.6 percent, the average youth unemployment rate is approximately 25 percent. In most MENA countries youth unemployment is much higher than adult unemployment (i.e. the unemployment rate amongst persons older than twenty-five). Most countries in the MENA region suffer from a lack of job creation and thus a lack of opportunities for the young population. Job creation has lagged behind the population growth over the last 30 years. This is a worrying trend.

The average young unemployed person in the Arab countries of the MENA region is male and under twenty-five. A young Arab citizen usually

has three options: 1) to wait for an opportunity in the local public sector, which has become less attractive owing to stagnating wages; 2) to emigrate to outside the region (mainly Europe and North America) or inside the region to GCC labour markets; or 3) to work in the informal sector, which provides little or no security and protection and often pays only dismal salaries. Option 1 often involves personal networks to obtain a job. At the same time, public sector jobs still provide the highest wages despite their stagnation, increasing the wage bill of the public sector. Option 2 requires specific skills such as engineering or medicine to make young people attractive to Western employers. The GCC economies import labour for high-skilled private sector jobs, yet there is hardly any political integration in the economies as non-nationals have limited rights compared with nationals. This means foreign employees have no protection that allows them to remain in GCC countries if they lose their employment. Option 3 is the most unprotected option because the informal sector has by nature very low protection. Therefore, and as Malik and Awadallah point out, the public sector is "the main avenue for job creation". The employment reality is still almost entirely delegated to the public sector, which is unable to cope with the demographic pressures across the region.

Female inclusion in the labour market is notoriously low in most countries. Only Israel has a relatively even workforce between men and women, with women representing 47 percent of labour in the economy. Turkey and Kuwait have a female workforce share of about 30 percent. All other economies are well below 30 percent. However, the trend has at the same time been towards more gradual involvement of women in the labour force. In particular, Palestine achieved a notable success in almost doubling the percentage of women in the labour force from 1.6 percent in 1990 to 20.3 percent in 2016. Only Egypt (from 26.3 percent to 23.1 percent) and Syria (from 17.5 percent to 14.7 percent) have seen a decline in female involvement in the labour market, yet these have specific national reasons. While Syria's labour market has been negatively affected by the ongoing war, Egyptian women are discriminated against through poor education opportunities, high rates of illiteracy (37 percent) and social and economic conditions that developed after the Egyptian Revolution in 2011.

The low integration of women negatively affects economic development in the MENA region. Greater rates of female employment are affected by, amongst other factors, access to higher education and increased urbanisation, which have made labour force participation both more attractive to employers and manageable for working mothers. Their greater and more equitable inclusion in urban labour markets could mitigate the otherwise ageing population, allowing for greater levels of employment and resources for financing retirement. Increased participation in the labour market can help respond to shifting demographic patterns by compensating declining num-

bers of young people relative to the share of the population of retirement age. However, without meaningful transformations in the organisation and operation of national economies, growing female labour force participation will likely mean more people sharing more equitably an already inadequate supply of employment opportunities. Instead, ensuring both the immediate and longer-term durability, equitability and sustainability of regional economies will help increase women's share in the labour market, and parity in accessing employment opportunities, pay and treatment in the workplace. This will require the generation of new economic opportunities. Mobilizing large young populations and greater proportions of female and older-aged labour will also help capture the economic advantages of the "demographic dividend", as illustrated in Section 1 above.

Without meaningful transformations in the organisation and operation of national economies, growing female labour force participation will likely mean more people sharing more equitably an already inadequate supply of employment opportunities

The final challenge of the MENA labour market is the role of education. With the notable exception of Israel, Lebanon and Turkey, the MENA region has generally low-quality educational systems. At the same time, a skills gap exists between what is taught in schools and universities and what is required by the labour market. For example, 63 percent of Saudi university students complete degrees that are in relatively low demand by the private sector such as agricultural sciences, education services, and humanities and the arts. Despite these challenges, the MENA region has also experienced positive news. Governments have increased their spending on education to 5.3 percent of GDP on average. Girls in schools outperform their male counterparts in subjects such as maths. At the same time, net enrolment rates have increased to almost 92 percent across the region. However, the region needs greater investment in STEM subjects to prepare students for jobs required by a changing private sector.

The resulting picture of the labour markets has been described as an "authoritarian bargain social contract" between regimes and societies to politically appease populations in the region. Such a contract only works if the public sector has the financial means to invest in job creation. (...)

GOVERNMENT DEBT IN MENA COUNTRIES

Given the reliance on the public sector to provide jobs in the region, the wage bill is having significant impacts on public finances and therefore public debt. This section illustrates the financial health of the public sector to show that the current social contract is unsustainable in the MENA

region. There has been increased interest in public debt as a macroeconomic indicator, particularly after private debt was bailed out by states in the West after the financial crisis of 2008/9. Government debt differs in the four categories of countries. RRLA and RPLP countries have few to no significant problems with government debt, since this is low or in the range of the 60 percent threshold of GDP/debt ratio that is widely seen as important for long-term financial stability and has been made one of three stability criteria of the Eurozone's Maastricht. All RRLA and RPLP countries have seen a decline in public debt since the 1990s, with a relatively healthy outlook for the coming years.

In the RRLP countries, public debt correlates with oil revenues and political events. It was higher during the 1990s when oil prices were low, then it was significantly reduced to levels below 40 percent GDP/debt ratio in the 2000s when oil prices spiked. Only Bahrain had a debt ratio of 62 percent in 2015, owing to its vulnerable economic position with limited savings, high borrowing and low cash reserves. At the same time, it is expected to see further increases of external debt to 83 percent in 2016. The government has begun to address fiscal health by curbing spending, cutting subsidies and by increasing taxes. The one-sided reliance on oil revenues makes the region's economies vulnerable to external shocks and renewed spikes in public indebtedness. Kuwait, Saudi Arabia and Libya borrowed more extensively when faced with political crises such as the Gulf War in 1991 and the Libyan regime change in 2011. However, their debt levels have returned to levels below 40 percent, but are set to rise as the decline in oil prices since 2014 has caused large budget deficits.

The most indebted countries are in the RPLA grouping. No data is available for Syria. Despite decreases since the 1990s, government debt in the RPLA countries is well beyond the 60 percent threshold, with the notable exception of Tunisia where it is at 53 percent. Lebanon tops the list. It has the fourth-highest debt of all countries in the world at 139 percent of GDP (after Japan, Zimbabwe and Italy). It stands out as the most indebted MENA region economy. Lebanon's public debt was spurred by post-civil war reconstruction measures, which were largely financed by external and internal borrowing.

Jordanian, Egyptian and Mauritanian GDP/debt ratios are just below 100 percent of GDP, causing similar concerns about the financial health of public finances. In sum, the RPLA countries are the most vulnerable. These are not only challenged by the need for job creation to tackle youth unemployment, but their social contract is also severely challenged by high government debt. There have been frequent calls for measures to tackle escalating public debt in RPLA countries to avoid government bankruptcy. Proposed measures include tax reform, privatisation of publicly owned companies, reduction of fuel and food subsidies, public–private partner-

ships in infrastructure investment and more fiscal discipline of governments. However, the International Monetary Fund (IMF) has conceded that governments need to be supported to deal with the refugee crisis in the region. A "Greek solution" involving austerity measures is unlikely to take place in the coming years in order to avoid defaults, as long as RPLA economies such as Lebanon, Jordan and to lesser extent Egypt play such an instrumental role in mitigating the refugee crisis in the MENA region. At present, the IMF has called for grants and conditional loans for countries exposed to high refugee inflows. However, a debt haircut together with long-term measures to promote private sector jobs growth will be inevitable sooner or later. This brings us to the final section on trade and globalisation. It will shed light on how the MENA region has utilised (or not) opportunities through international trade and the global economy, and how oil dependence figures in its longterm development prospects. (...)

EXPORT AND IMPORT TRENDS

The region's share of global exports fell from 2.3 percent in 1990 to 1.8 percent in 2008. The key export commodities are still oil and gas. It comes as no surprise that the RRLA and RRLP countries are leading this trend. However, mineral fuels exports in the economies of Egypt, Yemen and Sudan in the RPLA grouping have also played a highly significant role. Turkey and Israel on the other hand, as RPLA and RPLP countries respectively, have the most diversified economies, which is reflected in their OECD status. At the same time, MENA economies are key global importers of machinery, manufactured goods and food. While food imports can be explained owing to the lack of readily available land and water resources in the region, the significance of machinery and manufactured goods shows the lack of economic diversification and heavy reliance on the assembly of intermediate goods in the case of Turkey. Too much reliance on oil and too little emphasis on economies with broader economic foundations, such as strong industrial production and service industries, amplify the youth unemployment challenge.

MENA countries lag behind globally in terms of trade integration and investment flows. Henry and Springborg have pointed out that the MENA region has fallen behind other world regions in the age of globalisation, especially emerging markets in Asia, but also in Latin America. This assessment chimes with the resource curse literature. Economies of resource abundant countries not only tend to focus on non-tradables as a result of Dutch disease and a real effective appreciation of the exchange rate; they also develop political structures that are hampering economic development, such as resource capture by elites, corruption, rent seeking and educational shortcomings.

An analysis of trade pattern indeed reveals a heavy concentration of oil and gas exports of many countries in the MENA, while imports are dominated by manufactured goods. Yet there are some striking differences and also evidence of diversification. Gulf countries such as Saudi Arabia, the UAE and Qatar have built up thriving heavy industries in petrochemicals and aluminium. Dubai has pioneered diversification into trade, logistics, services and tourism and has inspired copycat projects in other Gulf countries, but also beyond in such unlikely places as the Kurdistan region of Iraq and Morocco. Morocco has the largest global phosphate reserves. Like the Gulf countries in the case of petrochemicals, it has moved further up the value chain by investing in fertilizer production and other chemical industries. There is considerable light manufacturing in Morocco, Tunisia, Egypt and above all Turkey, ranging from car manufacturing and car supplies to textiles and food processing.

Material factors for the MENA region: Data sources, trends and drivers

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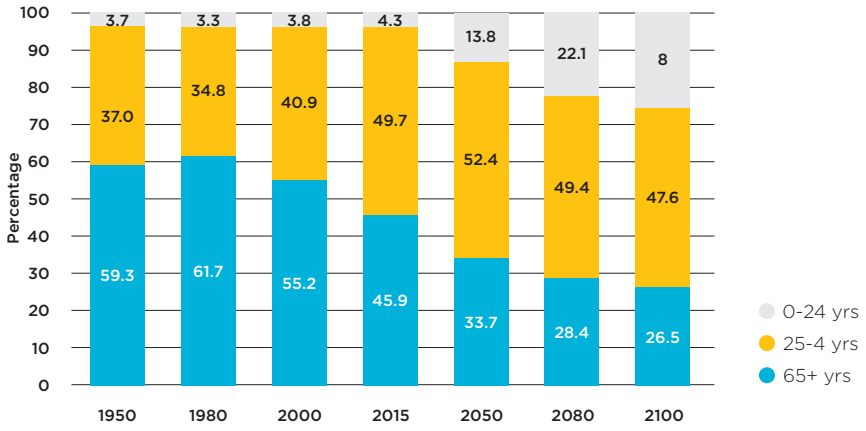
KEY DEMOGRAPHIC TRANSFORMATIONS FOR THE MENA REGION (1950-PRESENT): POPULATION GROWTH, URBANIZATION, YOUTH AND MIGRATIONS

The MENA countries have been growing fast. While in the 1950s, the total number of people in the MENA countries totalled 102-134 million, the number almost tripled to 303-339 million in 1990. In terms of population growth, the MENA countries were affected by strong migration patterns. While North African countries grew organically by almost 2-3.5 percent per year, the West Asian countries of the MENARA project experienced significant differences thanks to the political-economic developments in the region. While the Occupied Palestinian Territories saw a net loss of population during the Arab-Israeli wars (with increases seen again later), Jordan and the Gulf states experienced population growth patterns of 10-20 percent growth. The Hashemite Kingdom of Jordan was particularly affected during the Arab-Israeli wars; the Gulf states saw a strong net population increase from 1975-1985 when demand was high for foreign workers in the hydrocarbon industry.

The MENA region's population is growing fast. Its population has doubled in the three decades since 1980. In 2015, the total number of people living in the MENA countries is 493 million. It is expected to add another 110 million people by 2030, which translates into an average annual growth rate of 1.8 percent. This is almost twice the global population growth rate of 1 percent. In 2050, it is estimated that the total number of people living in the MENA countries will be 730 million. It is therefore one of the fastest-growing regions in the world, and this growth will put immense pressure on national resources and the environment.

Another important trend in the demography of MENA countries is rapidly increasing urbanization. The MENA region has the fastest-growing urban populations in the world, with approximately 70 percent of inhabitants living in cities. The urban hotspots are the GCC countries, Egypt and Tur-

key. The latter two are home to the region's only two mega cities (defined as more than 10 million people), Cairo (18 million) and Istanbul (14 million), which are both growing, yet much less rapidly than their South and East Asian counterparts. While Cairo is predicted to reach 24 million, Istanbul is predicted to grow to 16 million by 2030. However, the MENA region is also home to cities in the second category of large urban settlements (5-10 million inhabitants). These cities are Tehran, Jeddah and Baghdad. In terms of age structure, the MENA region is defined by young people. One-third of the population is younger than 15 years of age. This will further increase population pressures in the region when these youngsters reach childbearing years and enter the labour market.



The MENA region also has a history of international and regional migration. There are three types of migration patterns. The first is forced migration and internal displacement as a result of crises and conflicts across the region, particularly in Iraq, Libya and the Syrian Arab Republic. The second is economic migration within the region and transiting through the region, with the particular destinations being Europe, as well as towards Gulf countries. In recent years, North Africa has become a hub for transiting migrants from Sub-Saharan Africa, who seek to enter Europe via the illegal and dangerous crossing of the Mediterranean Sea from Libya and Egypt. In addition, Syrian refugees have entered Europe through Turkey, Greece and the Balkans. Third, there is a movement of (regular and irregular) labour migrants both within and from outside the MENA region. These migrants come from Sub-Saharan Africa, East and South Asia and even the countries of the former Soviet Union, seeking employment in GCC countries but also in Lebanon, Jordan, Egypt and Morocco.

KEY ENVIRONMENTAL DRIVERS FOR THE MENA REGION (1960-PRESENT): POPULATION GROWTH, CLIMATE CHANGE, WATER SCARCITY, SOIL DEGRADATION AND FOOD AVAILABILITY

The environment in the MENA region has been a concern for many scientists and decision-makers in recent decades. As Allan notes, "the MENA region had in practice run out of water [...] in the 1970s". Water resources (both surface and groundwater) have been gradually depleted, leaving the region heavily dependent on the world market to procure food. These "virtual water imports" have allowed the MENA region to enjoy a "form of food and water security" thanks to readily available food from global food bowls such as North and South America. The MENA region is and will remain the largest importer of staple food commodities such as wheat, soy, sugar, rice and animal feed. Without access to the world market, the MENA region would face a dire future. Although some academics have pointed to climate change as a reason for the outbreak of the war in Syria, one should treat environmental factors with caution. The dismal environmental situation in the MENA region undoubtedly contributes to political, social and economic problems. However, environmental factors are not the root cause of political and social unrest, only contributing factors. The same is true for increasing levels of land degradation. About one-third of Arab land is severely degraded due to overuse of pesticides, mono-cropping and over-exploitation of land resources for grazing and crop growth.

Environmental factors take a heavy toll on the region's ability to achieve food and nutrition security. Dependence on the world market especially raised eyebrows among decision-makers during the 2007-08 and 2010-11 food price spikes. As some researchers have noted, the volatility of food prices could increase the vulnerability of the region to future price shocks. Arab governments have been among the most agile investors in farmland in developing and industrialized countries. This so-called "land grabbing" has been heavily criticized by the international community due to its murky nature. Although Arab governments were linked to a wave of investments in land in the post-2008 period, very few (if any) investments materialized. Moreover, climate change will also take a toll on the region. Recent studies suggest that a changing climate could lead to increased incidence of heat waves leaving areas such as the Gulf states uninhabitable for human beings. In many ways, environmental factors may be the crucial bottleneck for economic and social development in the coming decades. (...)

Available historical environmental data is scarce. The only database which provides historical data on water resources is Aquastat. Yet the most useful and comprehensive data is available on water resources availability (ground and surface water, water through infrastructure) and water per capita. (...). Data on irrigation expansion is scattered and unreliable, while data on crop yields is

generally not available. Data on land use change is available via FAOSTAT. For the MENA region, land use change means in particular urbanization. However, urbanization trends have not been mapped by any database. Only raw data is available, which could be mapped by WaterWorld.

Data on water per capita shows that 15 out of 18 MENA countries are experiencing water scarcity

An important material environmental factor in MENA countries is soil degradation. The degree of soil degradation and the degree of soil erosion is available from GLASOD, which was launched in 1991. On water, the general trend is declining water availability per capita due to population growth. While most of the MENA countries were abundantly endowed with water resources in the 1960s and 1970s (with the exception of the GCC countries, Palestine and Libya), availability has sharply declined since the 1980s. Other environmental data shows a very alarming current picture. Historical data is mostly non-existent, hence the analysis should focus on current trends and some future indications of how climate change, for example, may worsen environmental factors in the MENA region.

Climate change is a threat multiplier that can increase or decrease the threats posed by water and food shortages and by land degradation. Climate change is sure to have an impact in a region so defined by climatic extremes. Even small changes in rainfall and temperature can make a difference to regions that are already extremely hot and dry. These differences can be positive and negative. For example, rising sea levels may put the Nile Delta in Egypt at risk of flooding. Whilst climate change will increase temperatures globally, changes in rainfall patterns are much more complex and uncertain and some regions may become drier whilst other regions become more wet. This may also change over time, such that increased dryness is followed by increased wetness or vice versa. The key effects of climate change will be to undermine business as usual and to force agriculture, infrastructure and populations to adjust to new and newly changing conditions. No two projections agree on how rainfall will change, so we will need to consider not adaptation to a particular future but adaptability and resilience to any reasonable future. The figures below from the WaterWorld Policy Support System indicate projected increases in rainfall for much of the African MENARA hydrological region, particularly the mid to upper Nile, with decreases in rainfall expected for the North African coast. Combined with increases in temperature (and thus evaporation), these will lead to increases in available water for the southern hydrological region but decreases for the northern hydrological region. Further work is required to understand to what extent these changes balance out over basins and to what extent annual changes are evenly spread or highly seasonal, all of which have important hydrological implications. (...)

Data on water per capita shows that 15 out of 18 MENA countries are experiencing water scarcity. Eight countries are even facing absolute water scarcity below 500 cm3/capita. The most waterabundant countries are Iraq, Iran and Turkey. Moreover, Egypt's share of the Nile may further decline due to dam construction in East Africa, which means its water per capita availability may drop further during the timeline of the MENARA project. Despite increasing water scarcity in the MENA region, the Global Hunger Index shows that food availability and nourishment levels have actually increased in all MENA countries. Only Iraq has seen a decrease in food security levels, mostly due to political issues like the multilateral UN embargo that lasted from 1990-2003. Yemen is considered seriously food insecure but has improved from alarmingly food insecure. Egypt, on the other hand, is exposed to moderate food insecurity.

The most important driver of environmental degradation in the MENA countries is population growth and subsequent migration to urban areas. Economic growth in the GCC countries has attracted millions of people from within the region and beyond, which places further constraints on limited natural resources in the hyper-arid areas of the MENA member states. Prime agricultural land has been used for urban development in places such as Jordan, Lebanon, Tunisia, Syria, Egypt, Morocco, Iraq, Iran and Algeria. Due to protectionist policies aimed at food self-sufficiency, the majority of the MENA countries are over-exploiting their environment. Moreover, conflict in Syria, Yemen and Iraq has displaced millions of people, putting environmental constraints on certain hotspots such as Jordan, Lebanon, Turkey and Egypt. (...)

Technological trends in the MENA region: The cases of digitalization and information and communications technology (ICT)

EDGAR GÖLL & JAKOB ZWIERS

MENARA Working Papers, No. 23. (2018)

TECHNOLOGY TRENDS IN INFRASTRUCTURE AND INNOVATION IN THE MENA REGION

Basic infrastructure is an important prerequisite for socio-economic development in modern societies, both in terms of overall advancement and for innovation – particularly in the context of international market pressures and global competition, including around access to scarce and limited resources. Due to demographic trends, social challenges and the rapid pace of urbanization, there is huge pressure on existing general infrastructure and an increased demand for new infrastructure (i.e. public buildings, roads, bridges, as well as fast Internet, broadband etc.). The MENA region is expected to become the fastest growing region globally in this regard, overtaking the 2016 leader Asia. MENA countries have invested 3–5 per cent of gross domestic product (GDP) in infrastructure in the last decade, which is higher than in Latin America, Europe and Central Asia but lower than in South Asia and East Asia. But MENA's infrastructure investment and maintenance needs up to 2020 are estimated at about 106 billion US dollars per year, or 6.9 per cent of the annual regional GDP.

These overall trends and numbers have to be broken down. The estimated differences in needs and abilities for investing across sub-regions are very high. The countries with the greatest investments in basic infrastructure in MENA are Saudi Arabia, Qatar, Kuwait and United Arab Emirates. Since 2007 Oman has completed fifty-four infrastructure projects, which is the highest number of any MENA country. Developing oil exporting countries are expected to commit almost 11 per cent of their GDP annually (48 billion US dollars) to improving and maintaining their infrastructure endowments. Oil importing countries will need to invest approximately 6 per cent of their GDP to ensure the provision of infrastructure on a sufficient scale to meet their growth as well as their poverty reduction targets. Investments are likely to be

especially high in the electricity and transport sectors, particularly road construction. Electricity and transport are each estimated to account for about 43 per cent of total infrastructure needs in MENA, followed by ICT (9 per cent) and water and sanitation (5 per cent). Fulfilling the electricity needs alone would require approximately 3 per cent of the annual regional GDP, or 46 billion US dollars, of which 10 billion would be spent in oil importing countries and around 36 billion in oil exporting countries. So, when it comes to infrastructure the focus is on the increasing need for energy and electricity supply. Entrepreneurs and the business community see infrastructure issues as a "serious problem" in MENA countries.

This deficit is underlined by international comparisons:

> *In contrast to other fast growing countries in the world, the Arab region has suffered in the last decades from substantial barriers to sustainable growth, which greatly affected the youth population and their integration in productive, growth-driven economies. Gauged by the level of industrialization, the level and sectoral composition of private investment or the productivity and technological innovation of firms, no Arab country, especially the nonresource rich, is on the path of the structural transformation that has led the rise of fastgrowing economies such as China, Turkey, Poland, Malaysia and Korea.*

More specifically apropos innovation processes and economic clusters, again empirical evidence proves the deficits in adoption of new technologies in the region vis-à-vis the major factors for success.

> *Statistical and econometric results [...] suggest that cluster performance, brought about by the adoption of new technologies by firms within it, depends on two sets of factors. One set are the firm-specific characteristics: academic qualification and knowledge of MDs, skill intensity of the workforce, motivation of MDs to provide workers with regular training for effective use of new technologies, sales turnover and profit margins. The second set of factors consists of cluster-specific variables: the presence of training and collective internal technological support institutions and the benefits of inter-firm sharing of facilities. The adoption of ICTs depends indirectly on the local and national ICT infrastructure since these provide the backbone for firm and individual ICT use.*

A similar assessment has been published recently on approaches to supporting startups and problems in the MENA region from a business perspective. From a distance, it seems as if the Middle East is in the middle of a startup boom. New investments are increasing and approaching 1 billion US dollars. But closer investigation reveals that the biggest part of this rise in investments is related to just two companies (see below) and to a single country (UAE). Referring to recent data from Magnitt, McKenna reports that in 2016 the amount of cash being invested into tech firms more than quadrupled, reaching 870 million US dollars. (...)

Innovations need specific investments, including knowhow and capital, which very often have to come from international corporations, banks or institutions. How to become attractive for such investments is a major challenge for politics and business networks. The attractiveness of investing in most countries in the MENA region is low compared to East Asia or parts of Latin America. World Bank data compiled by The Economist in 2017 show how negatively the situation in MENA countries has been assessed in recent times. The main reasons for this situation are that bureaucracy, combined with the lack of government support in many MENA countries, has led to a situation that seems less open to startups than in many other parts of the world. But there some governments that seem to have changed their attitude in order to become globally competitive. For example, Egypt recently introduced a new bankruptcy bill that abolishes imprisonment for company founders whose businesses fail. (…)

Many of the above-described technological characteristics in the MENA region will have a decisive influence on the future, and therefore also on future generations. As is the case with any technological development or innovation, the implementation of, for instance, ICT into the culture and economy of a country depends on a broad spectrum of preconditions in the sense of required innovation systems. In this respect, one consideration is related to the different sociocultural milieus of a given society, including – in the context of new technologies – generational differentiation. (…) With regard to this outcome in the MENA region, the situation in the different countries is very diverse within and between countries. Innovation is related to human development, education and qualifications. According to the findings of the UNDP there are several tasks that have to be managed in order to advance these societies:

- Reviewing management institutions and their readiness to use and absorb technology, particularly in the field of education and training.
- Emphasizing intellectual property rights and reviewing the legislation and laws governing the use of technology in a way that achieves its deployment and supports the freedom of using it.
- Training on quality systems and enabling individuals to use technology efficiently.
- Encouraging foreign investment to achieve a quantum leap [in terms of technological and ICT advancement], especially in the areas needing highly-qualified cadres.
- Developing major projects to create a critical mass to deploy, employ and produce technology in schools, universities, homes, productive institutions, government, and public life in all areas. (…)

ECONOMIC CONDITIONS FOR TECHNOLOGIES

Economic growth in the MENA region has changed again lately, due to the influence of various factors.

> *Economic growth in the Middle East and North Africa (MENA) region is expected to rebound to an average 2 percent in 2018 from an average 1.4 percent in 2017. […] The mild rebound in regional growth reflects the positive impact of reforms and stabilization policies undertaken in many countries in tandem with the recent pick up in oil prices and oil production and rising external demand.*

Although the outlook for MENA remains positive, there are still geopolitical tensions, challenges due to the displacement of people, including refugees, and the rising level of debt in the region that urgently have to be addressed. There will also be an increase of young people entering the labour market in the coming decades. Hi-tech jobs in the services sector are especially likely to emerge due to rapid technological change. Therefore, several MENA countries have already developed economic strategies to benefit from this new, disruptive technology. A fast-growing pool of university graduates in combination with heavy penetration of social media and smartphones can serve as a basis for the development of a digital sector wherein new jobs can be created.

According to the World Bank, the key factors in several MENA countries (Algeria, Egypt, Morocco, Libya, Tunisia and Jordan) limiting development are a lack of effective competition and appropriate regulation. The report recommends promoting facilities-based competition, addressing underserved areas of the country, applying new models of infrastructure supply and implementing measures to lower deployment costs. Nevertheless, this paper suggests that the governmental use and control over the extension and maintenance of ICT infrastructure need to be assessed separately. A number of governments of the MENA region have already taken steps to encourage Internet proliferation and accessibility, mainly in order to boost economic development. But large investments for (digital) infrastructure development as well as investments in the ICT sector are still necessary.

In terms of economic development MENA countries can be split into two sub-groups: oil and nonoil countries show strong differences in regard to ICT impact on regional growth. The different sub-regions reveal a high positive effect of ICT on growth for the oil-MENA countries (Gulf states). Therefore, a significant growth payoff from ICT can be acknowledged only for the oil-MENA countries. This is mainly because these countries succeed in their investment categories and quality choices as well as in capturing and forming the required qualifications for human capital that together form an essential background to benefitting from ICT.

A number of countries in the MENA region – including Egypt, Turkey, Morocco, Jordan, UAE and Tunisia – have successfully positioned themselves in the market of global ICT-enabled services and ICT outsourcing. For example, Egypt, as a popular destination for ICT outsourcing, currently supports 90,000 directly related jobs and is growing at 7.5 per cent annually, partly driven by business from Saudi Arabia and the Gulf. Meanwhile, in Turkey more than 80,000 workers are employed in the ICT sector, which produces assets of 1.6 billion US dollars.

In some regions and countries, for example in Palestine, a vibrant startup culture has been shaped by vanguard persons and groups. Startups appear where there are innovative business opportunities for achieving economic development, despite impediments such as power cuts, poor Internet infrastructure and political restrictions. Nevertheless, significant external conditions such as the blockade of Gaza by the government of Israel hinder and obstruct overall economic development (i.e. the manufacturing sector) in this case. "Due to the blockade in place since 2007, Gaza's exports, according to World Bank's Country Director for West Bank and Gaza, Steen Lau Jorgensen, 'virtually disappeared' and the manufacturing sector has shrunk by as much as 60%". With new business models focusing on digital solutions and hardware development, young Palestinian entrepreneurs fill the gap that the government is unable to deal with and provide a sense of economic independence – from Israeli influence as well as dependency on foreign aid. The startup boom in Palestine has been catalysed by an abundance of accelerators, incubators and venture capital funds through which new forms of economic progress are fostered via the means of innovation within ICT and digital development.

In the Middle East, online shopping seems to be reaching a whole new level. "Websites in Egypt, Jordan, and throughout the Gulf are making online ordering faster and easier than ever – allowing customers to use centralized websites to order from their favorite restaurant menus and product catalogs". Alongside website ordering, bilingual websites assist expatriates in using e-commerce. With the aid of virtual and augmented reality technology, fully immersive retail experiences could soon be possible – allowing consumers to navigate around a virtual store.

In many African countries, FinTech has gained high economic relevance in various respects and can even become an economic game-changer under certain conditions and in particular areas –especially in bringing digital, mobile financial infrastructure into rural areas and promoting progress of the digital industry, creating new jobs as a result. Online payments facilitate transactions fluidly across geographic borders. At this point, the situation is not clear enough to assess the potentials and resonance of such developments within the MENA region.

Another growing sector in the Middle East is mobile gaming. Between 2015 and 2022, the mobile game development industry in the Middle East "is predicted to grow from $680 million to $2.3 billion". Currently, just 1 per cent of the content in local app stores is available in Arabic. Therefore, private investors as well as governments, including Iran, Jordan and Saudi Arabia, "are sponsoring hubs to create mobile games tailored to local language and culture".

AUTOMATIZATION AND THE JOB MARKET

Due to the high levels of unemployment in the MENA region, as well as the deficits in the education systems and social security in combination with the state of demographic development, the MENA states are under considerable social pressure. Among the 100 million young men and women in the region, unemployment and under-employment are very high: almost a third of active youth in the Arab world are unemployed.

> *Young Arab women are especially excluded from labor markets, as more than two-thirds of women between the ages of 15 and 29 are outside the labor market, the highest rate in the world. Lack of jobs especially for the young has been a characteristic of the region's economic growth performance in the past fifty years.*

Economic growth in the Arab region in recent decades has not been able to absorb the growing needs and expectations from the surging numbers of youth. "The frustration among Arab youth entering the job market is compounded by social exclusion, as the lack of job opportunities results in lack of access to housing and marriage, which hinders the transition to independent adulthood". The region's population, currently estimated at about 400 million, is expected to reach 600 million by 2050. More than half of the population is under 30 years old. Thus, the social and job pressure is ever increasing while education, unemployment and food prices are still rising. The latest labour market data show that the unemployment rate remained stubbornly high in Egypt, Iran, Iraq, Jordan, Morocco and Tunisia in 2016. Forty per cent of the region's unemployed are young jobseekers. Real GDP growth in MENA is projected to stay at its lowest level for the second consecutive year, at around 2 per cent in 2018, a percentage point less than that predicted in April 2018. "Youth unemployment in the MENA region stands at 31% and university graduates are making up nearly 30% of the total unemployed pool".

The WEF's "Future of Jobs" analysis found that, by 2020, 21 per cent of core skills in the countries of the Gulf Cooperation Council and 41 per cent of those in Turkey will be different compared to skills that were needed in 2015. With regards to the continuous automatization and digitalization in

most economies of the MENA region, it has been estimated that "41% of all work activities in Kuwait are susceptible to automation, as are 46% in Bahrain and Saudi Arabia, 47% in the UAE, 49% in Egypt, 50% in Morocco and Turkey and 52% in Qatar". Furthermore, "[s]ome of the most common types of high-skilled employment in the MENA region include commercial bankers, corporate finance specialists and accountants, schoolteachers and academics, engineers, quality assurance professionals and information technology consultants".

In the Middle East, online shopping seems to be reaching a whole new level

With increasing Internet access there will be growing opportunities for specific business models, including for women working from home via the Internet, who otherwise might have difficulty in finding adequate jobs. Nevertheless, this kind of option needs specific cultural conditions. With regards to the requisite cultural conditions for employment and job creation, there are countries and sub-regions where the attraction of employment within state institutions is still much higher among the young generation as compared to employment in the private sector (one example being Saudi Arabia).

But most highly educated young people try to escape abroad or they give up on finding the right employment because of the lack of potential for personal career, change and development. Possible reactions to this scenario can be migration or aggression against a corrupt establishment. Karake Shalhoub and Al Qasimi argue that, by simplifying business procedures, cyber activities reduce the cost for businesses of complying with domestic and international trade regulations and reduce the cost of corruption.

New technologies are being selectively integrated in more and more educational institutions.

> *Educators are increasingly turning to tech to make learning both accessible and relevant to young mindsets, in preparation for a globally competitive workforce ready to take on tomorrow's challenges. The rise of new media is changing how we learn and communicate. Gaming, animation, and virtual networks demand a new style of literacy and promote new models for collaboration and communication.*

New digital formats could engage audiences of all ages, helping them gain new knowledge and augmenting skills – even in difficult socio-political states such as Syria. These digital formats are particularly needed in the MENA region because of its unemployment rate, which is the highest of any region in the world due to insufficient education systems. There is especially a rising demand for "higher-order analytical

skills and advanced digital literacy, as well as strengths in science, technology, engineering, and math (STEM) subjects, in particular computer programming". MENA countries graduate fewer students in STEM per year compared to other regions. Therefore, investments in the sector of "techucation" are to be expected. Within the MENARA project, one conclusion is: "MENA economies need greater investment in STEM subject skills (science, technology, engineering and mathematics) to prepare the younger generation for labour market demands". In particular, the problem of Internet access has to be approached more systematically in order to proliferate digital opportunities and to prevent a digital divide in society. Today, one in three Internet users worldwide is younger than 18 years old. However, at the same time 29 per cent of young people between the ages of 15 and 24 – especially in Africa and in Arab states – do not have Internet access. (...)

DIGITAL INFRASTRUCTURE

Innovation of new ICT-based services "has become one of the most important arenas for global competition, with outstanding examples in many [sectors] such as search engines (Google), auctions (eBay), gaming (World of Warcraft), music (Spotify), film streaming (Netflix) and travel services" (Airbnb). Although the digital use of all these services appears to be dematerialized, they do, however, need an infrastructure to innovate within.

> *A fascinating example is the success of Google. As documented by Iyer and Davenport, Google's innovation strategy depends heavily on their infrastructure. Google is "built to build", with a scalable infrastructure [that] enables an accelerated product development cycle – with support for third-party development. Such infrastructures are large networks [...] of technical and business components [...]. For a successful corporation, an effective digital infrastructure is [a crucial] resource.*

Furthermore, there is a dynamic between infrastructure and innovation: businesses "urge rapid innovations while the infrastructure supports incremental change". Nevertheless, there always has to be a digital infrastructure to facilitate innovation and economic development within a digital economy. In turn, in order to establish such infrastructure, resources (e.g. for broadband Internet, glass fibre, sensors) have to be deployed on a significant scale.

This development is quite advanced in Israel. One of the major promoters is the Weizmann Institute of Science, while Technion – Israel Institute of Technology is ranked among the top 75 academic institutions in the world for computer science. In most other countries of the MENA region, the situation

is quite different. This holds for the dissemination of broadband infrastructure in MENA, which is very important but seems underdeveloped in most countries. "Just as the steam engine was the driving force behind the Industrial Revolution", broadband Internet is today seen as "critical to the transition to knowledge-intensive economies across the world". In that sense, broadband Internet is seen as an essential driver of economic growth and social development. Although broadband is crucial to reduce poverty and create job opportunities, especially for young people and for women, penetration has been slow and the price of broadband service has been quite high in many countries. Regionally, gaps in infrastructure can be encountered, so that there is often poor connectivity between and within countries, between rural and urban areas.

most highly educated young people try to escape abroad or they give up on finding the right employment because of the lack of potential for personal career, change and development

Some experts are rather optimistic apropos to the labour market effects of ICT dissemination. Referring to earlier technological developments, they expect that strategic investments in the likes of ICT will be crucial to create new jobs, may foster peace and prosperity and map out a new path for the future for the MENA. For instance, with the National Broadband Network project, Jordan's government has established the foundation for a digital transformation, which will provide high-speed connectivity between public facilities, hospitals, schools and agencies. Such infrastructure will be necessary to capture the socio-economic benefits from the Internet of everything (and the Fourth Industrial Revolution) which promises a new era of growth. With 1,500 ICT-related companies employing more than 19,000 people, Jordan – which has already become a technology hub – can be seen as a potential model for the whole MENA region. Since ICT jobs require higher or at least new qualifications, there is the need to create educational programmes such as the International Labour Organization's Auto Technology Academy or Cisco's Networking Academy.

As well as possibilities for job creation, ICT and digitalization carry the potential to enhance healthcare infrastructure.

> *Telehealth technology, powered by the internet, can help fix this problem by enabling rural patients to have face-to-face video consultations with specialists and to have their treatment plans monitored from a distance. Cloud-based platforms also enable access to picture archiving and communication systems and collaboration software "as a service" to help improve the quality of care for patients by having radiology studies read remotely by qualified radiologists.*

ANNEX 1

Analysis of the MENARA fact-finding missions (2018)

Mustafa Kaymaz, Anna Busquest & Eduard Soler i Lecha

This report aims to provide an analysis of the interviews conducted under the scope of the MENARA Fact-Finding Missions. Three questions were asked to each respondent: (1) Which are the traditional or new actors that will shape the future of the Middle East and North Africa? Why? (2) Which are according to you the three main risks and the three main opportunities that the MENA region is facing? (3) Do you envisage a more or a less active European Union in the MENA region in the years to come? And what would you expect from it? This report was produced to make quantifiable and analyzable the responses given to these three open-ended questions. (...)

THE SAMPLE

There are 269 respondents in the sample. In addition to their responses to the said three questions, the dataset contains information on gender, country where the interview was conducted, region of origin, age and professional category. The distribution of respondents is as follows:

Gender: Although respondents are not representative of the population, it reflects the male-dominated elite class. Nevertheless, the number of female respondents in the sample will allow us to make comparisons. This variable will enable us to see if there are gender differences in perceptions regarding influential actors, risks and opportunities, and the role of and expectations from the EU.

Gender	Frequency	%
Female	53	19.70
Male	191	71.00
Missing	25	9.29
Total	**269**	**100**

Country: The country data shown in Table 2 represents where the interviews were conducted. This variable will help us identify the effect of geography on one's perceptions. We've grouped them in sub-regions when relevant.

Country	Frequency	%
Egypt	24	8.92
External (UK, Hungary, Russia, Canada, India, Switzerland, USA, China, Italy, Spain, Belgium, France)	66	24.54
Gulf (Qatar, Saudi Arabia, UAE, Kuwait, Oman)	27	10.04
Iran	15	5.58
Levant (Iraq, Lebanon, Syria, Israel)	51	18.96
Maghreb (Algeria, Tunisia, Morocco, Libya)	54	20.07
Sahel (Mali)	21	7.81
Turkey	11	4.09
Total	**269**	**100.00**

Region of origin: This indicates whether a respondent is originally from the MENA or other regions (Non-MENA). This variable will help us understand differences, if any, between people of the region and external observers (e.g. diplomats).

Region	Frequency	%
MENA	173	64.31
Non-MENA	84	31.23
Missing	12	4.46
Total	**269**	**100.00**

Age Group: Despite not representing the predominantly young demography of the region, the sample is representative of the age group of the decision-makers both in and out of the region. Nevertheless, it contains a significant number of young people which data will provide us if any, the generational gaps and differences of perceptions and expectations.

Age Group	Frequency	%
18-35	75	27.88
35-65	182	67.66
Over 65	12	4.46
Total	**269**	**100.00**

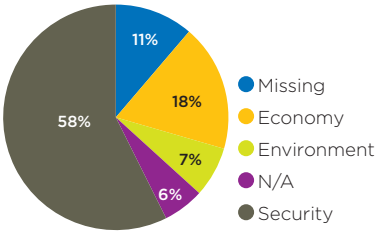
Professional Category: Next table indicates the professional categories of the respondents. It includes close numbers of the civil and public sectors. This variable will provide insights into the differences, if any, among people of various areas such as public officials, private sectors, and members of civil society, intellectuals, opinion makers, and activists.

Professional Category	Frequency	%
CSO, Intellectuals and Opinion-Makers, and Activists	115	42.75
Private Sector	22	8.18
State and Government Officials	130	48.33
Others	2	0.74
Total	**269**	**100.00**

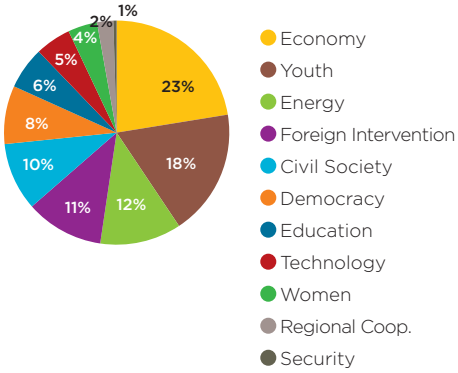
WHICH ARE ACCORDING TO YOU THE THREE MAIN RISKS AND THE THREE MAIN OPPORTUNITIES THAT THE MENA REGION IS FACING?

We first categorized the risks provided by the respondents into three groups: economy (such as to poverty, income inequality, lack of diversification, decreasing oil prices, etc.), environment (such as while climate change, water scarcity, etc.), and security conflicts and wars, nuclear power competition, foreign intervention, armed non-state actors, etc.). In case the respondent did not provide any risks or opportunities, the answer was coded as N/A. We then codified the opportunities in their order provided by each respondent. Then, we followed the same procedure as we did in the first question to combine the risks and opportunities under separate variables. After removing empty cells, as some respondents provide only one or two risks and/or opportunities, our sample increased from 269 to 373. Missing cases occurred due to the respondents who provided only opportunities or risks.

RISKS MENTIONED

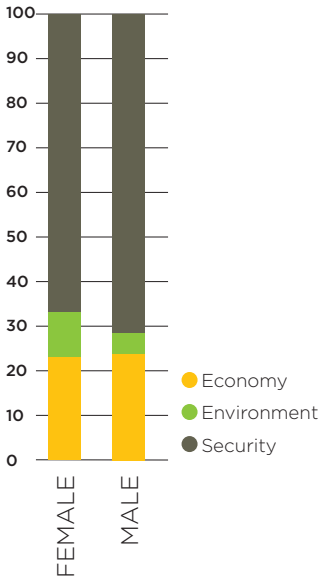


OPPORTUNITIES MENTIONED

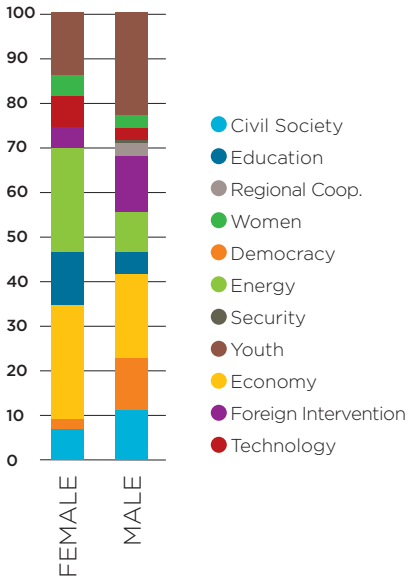


a. **Gender and risk/opportunities**: The proportion of environmental concerns is slightly higher among female respondents than that among males. Democracy's and youth's proportions are higher among males compared than that among females while economic opportunities, education, and energy have higher percentages among females.
b. **Location of interviews and risk/opportunities**: Environmental concerns are absent in interviews conducted in Turkey and less mentioned in Gulf countries and Iran while their proportion is the highest in Egypt. civil society as an opportunity has a higher proportion in the interviews conducted in Iran, Turkey, Maghreb, and External countries while having a lower proportion in the Gulf, Levant, and Egypt. Democracy also has a higher percentage in Iran, Turkey, and the Sahel but a lower percentage in Egypt, the Maghreb, and Levant. Economic opportunities have higher proportions in Egypt, the Levant, and Gulf and lower proportions in the Sahel and Turkey. Energy, on the other hand, has higher percentages in the External, Maghreb and Sahel, countries but lower percentages in Iran and the Gulf and is completely absent in Egypt. While women's proportion is higher in Egypt, they are not mentioned in the Levant, Iran, and Turkey.
c. **Age group and risk/opportunities**: The risk distributions are almost identical among age groups 18-35 and 35-65 while the percentages of economic and environmental risks are slightly higher among those over 65. Compared to the age groups 18-35 and 35-65, the proportions of economic opportunities are lower among those over 65. Education, on the other hand, has a lower percentage among the age group 35-65. Another interesting finding is that foreign intervention is mentioned as not perceived as opportunity by younger and older respondents. Regional cooperation's percentage is higher among the age group 35-65 but lower among the age group 18-35 while being absent among those over 65. Finally, it is interesting that youth has a higher proportion among the age group 35-65 than both age groups 18-35 and over 65.
d. **Professional category and risk/opportunities**: The 'CSO members, intellectuals, opinion-makers, and activists' and 'state and government officials' have similar risk distributions while the private sector category has a slightly higher percentage of security risks at the expense of environmental risks. Civil society is absent in the private sector category while the economy has a higher proportion in the same group. Compared to the other two groups, the 'state and government officials' category as a lower percentage for democracy as an opportunity. Foreign intervention, on the other hand, is absent in the private sector category. Finally, compared to the other two groups, the CSO members, intellectuals, opinion-makers, and activists have lower percentages for women and youth.

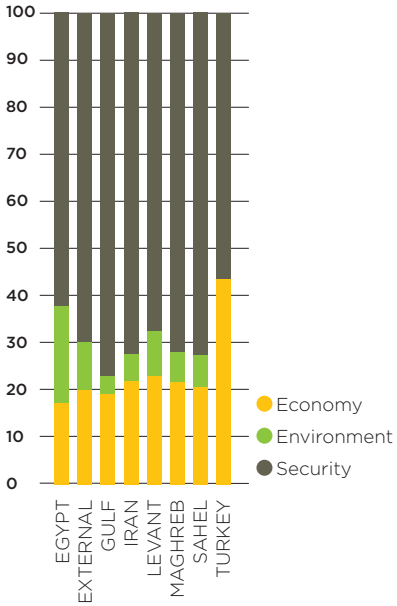
RISKS BY GENDER



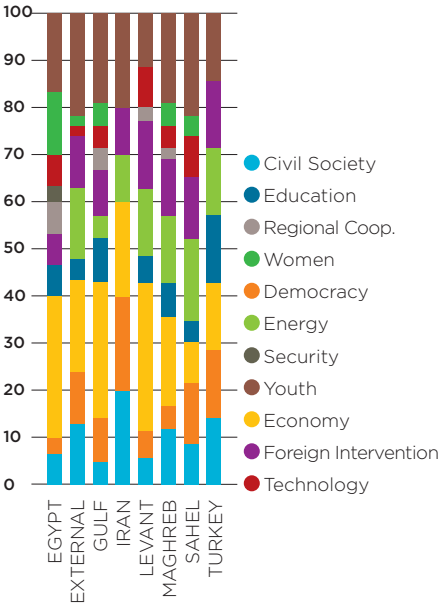
OPPORTUNITIES BY GENDER



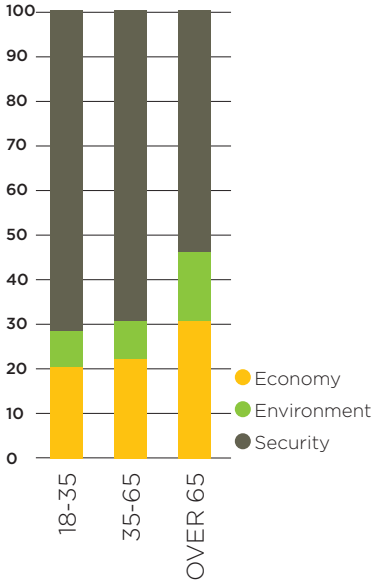
RISKS BY COUNTRY



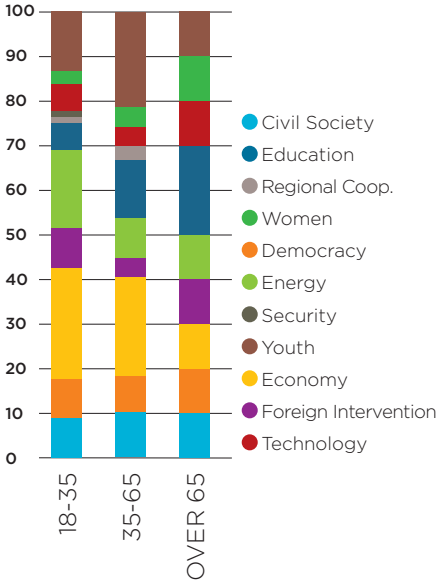
OPPORTUNITIES BY COUNTRY



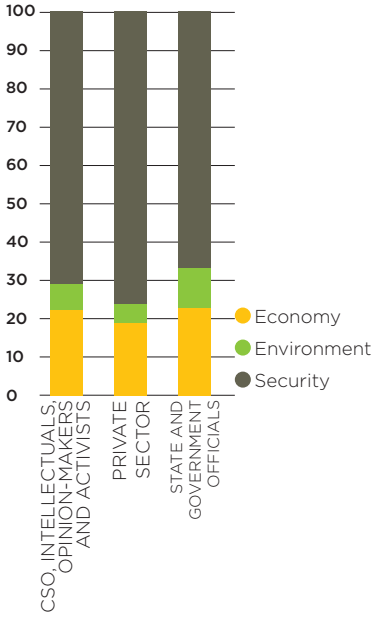
RISKS BY AGE GROUP



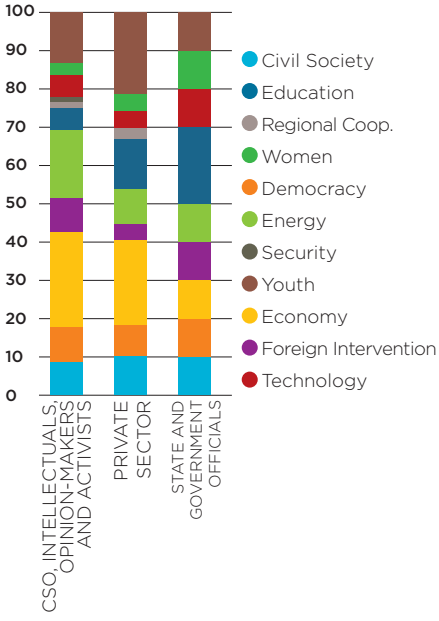
OPPORTUNITIES BY AGE GROUP



RISKS BY PROFESSIONAL CATEGORY



OPPORTUNITIES BY PROFESSIONAL CATEGORY



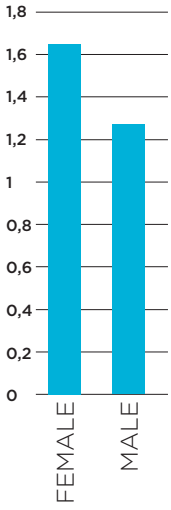
WHAT IS THE LEVEL OF HOPE ON THE FUTURE OF THE MENA REGION?

This section provides the level of hope observed among the participants as to the future of the MENA region. We codified the responses that either mentions that "there is no opportunity" or list risks without mentioning opportunities as "0". If the number of risks provided is higher than that of opportunities, the code is "1". Code "2" means that the respondent listed equal numbers of risks and opportunities. The responses containing a higher number of opportunities than risks were given "3" while those mentioning only opportunities but no risks were coded as "4." Finally "N/A" means the respondent did not give an answer to the question.

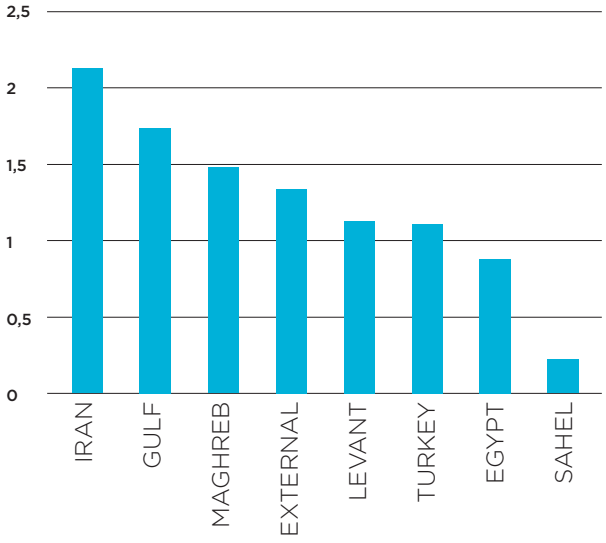
The average level of hope in our sample is 1.29 that is a view closer to pessimism but still containing elements of hope. The following tables and figures show the average level of hope among subgroups of responses based on the gender, region of origin, age group, and professional category of respondents as well as the country where the interview was conducted.

a. Gender and average level of hope: The level of hope among female respondents was above the general average while being lower among males.
b. Location of interview and average level of hope: The level of hope was highest in interviews conducted in Iran and the Gulf while it was lowest in Egypt and the Sahel.
c. Region of origin and average level of hope: The levels of hope among those of MENA origins and external observers were close to the general average while it was slightly higher among the former and lower the latter.
d. Age group and average level of hope: The level of hope among those over 65 was lower than the general average while it was slightly higher than the average among the age group 35-65.
e. Professional category and average level of hope: There is a more hopeful private sector and a less optimistic state and government sector.

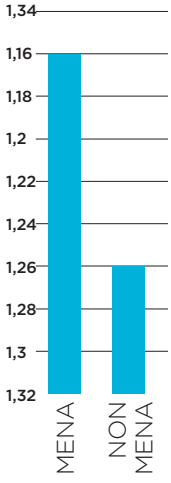
LEVEL OF HOPE BY GENDER



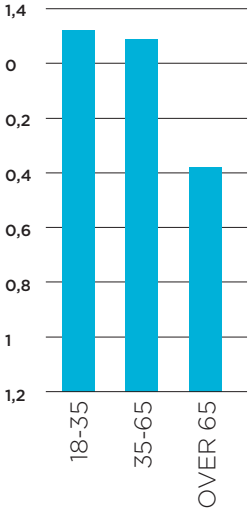
LEVEL OF HOPE BY COUNTRY



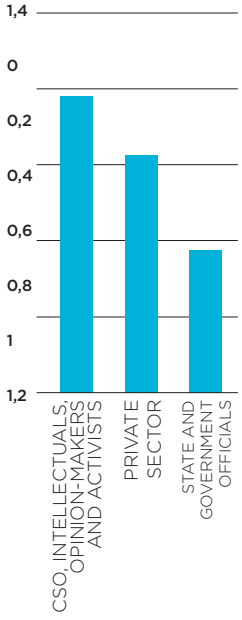
LEVEL OF HOPE BY REGION



LEVEL OF HOPE BY AGE GROUP



LEVEL OF HOPE BY PROFESSIONAL CATEGORY



Middle East and North Africa Regional Architecture: Mapping geopolitical shifts, regional order and domestic transformations (MENARA) is a research project that aims to shed light on domestic dynamics and bottom-up perspectives in the Middle East and North Africa amid increasingly volatile and uncertain times.

MENARA maps the driving variables and forces behind these dynamics and poses a single all-encompassing research question: Will the geopolitical future of the region be marked by either centrifugal or centripetal dynamics or a combination of both? In answering this question, the project is articulated around three levels of analysis (domestic, regional and global) and outlines future scenarios for 2025 and 2050. Its final objective is to provide EU Member States policy makers with valuable insights.

MENARA is carried out by a consortium of leading research institutions in the field of international relations, identity and religion politics, history, political sociology, demography, energy, economy, military and environmental studies.

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