A Green Recovery
for a More Resilient MENA Region

Youth Perspective on Energy, Climate and Mobility

A Youth Perspective Position Paper | November 2020

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FRIEDRICH EBERT STIFTUNG

Climate and Energy Project
مشروع الطاقة والمناخ

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هذا المصنف عن رأي المكتبة الوطنية أو أي جهة حكومية أخرى.

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Acronym	Description
COP	Conference of Parties
CCS	Carbon capture and storage
IRP	International Resource Panel
MTCO2 Eq.	Metric tons of carbon dioxide equivalent
OECD	Organization for Economic Cooperation and Development
FES	Friedrich-Ebert-Stiftung
GHG	Greenhouse gas
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
MENA	Middle East and North Africa
RE	Renewable energy
EU	European Union
CCUS	Carbon capture, utilization and storage
EV	Electric vehicles
UN	United Nations
UNIDO	United Nations Industrial Development Organization
UNFCCC	United Nations Framework Convention on Climate Change
NDC	Nationally Determined Contributions
TEC	Technology Executive Committee
CTCN	Climate Technology Centre and Network
TNA	Technology needs assessment
IRENA	The International Renewable Energy Agency
LCOE	Levelized cost of electricity
WEO	World Energy Outlook
CSP	Concentrated solar panels
PV	Photovoltaic
CSP	Concentrating solar power
EU	European Union
UITP	Union Internationale des Transports Publics

4.0: INTRODUCTION

Author: Ronja Schiffer

Living through a global health emergency has given the world a preview of what to anticipate from an unfolding climate crisis. Like COVID-19, climate change will exacerbate existing systemic failures in political and economic structures, social justice, and healthy ecosystems. Fortunately, this health emergency unveiled the enormous possibility to change course and catalyze the needed leap forward. It has presented a policy window for climate action and green recovery that places the wellbeing of the people and the planet at the center of rebuilding efforts. Decision-makers have an opportunity to leverage public policy to build back better for a healthy and resilient society.

Limiting global warming, reducing greenhouse gas (GHG) emissions, and adapting to fast changing realities are priorities for the majority of states worldwide. Achieving these goals requires changing the way we produce and live: water, food, buildings, transportation, and global trade, among other dimensions. Building resilience while tackling climate change impact is essential for an effective recovery from the COVID-19 crisis. Main components of this effort include restructuring a better and more resilient energy sector, abandoning fossil fuel systems, and prioritizing renewable energy, battery technologies, green hydrogen, energy efficiency, and carbon capture. All of these measures are key parts of global green economic recovery programs, e.g. in South Korea, the EU, and Germany. Crises such as COVID-19underscore the vulnerability of the Middle East and North Africa (MENA) region to climate change-driven impacts and crises, which can further erode economic and political stability. Capitalizing on the notable resource potential of the MENA region is key, as will be shown in Chapters2 and 3. Moreover, a shift towards digitalization, reducing transportation usage, and shifting land use planning are key factors to boost resilience for the future.

Engaging in participatory processes with innovative and sustainable agents of change who pursue these policies is critical for a green economic recovery. Youth, a major asset of the MENA region, are poised to be the champions of this process, gathering often-unheard voices within the region. The Friedrich-Ebert-Stiftung (FES) Regional Climate and Energy Project is continuing its efforts to empower young people from the MENA region to engage in climate and energy policy. Thanks to several training programs, young participants from six countries (Tunisia, Egypt, Lebanon, Palestine, Jordan, and Saudi Arabia) continued to deepen their knowledge on green economic recovery, energy technologies, climate modeling, technological change, resilience and sustainability as well as urban design, in particular the mobility transition. This is a chance for talented youth in the region to continue the exchange with policy makers started last year, where the previous publication was presented at the Conference of Parties (COP) 25 in Madrid. Thank you to all who participated, especially the authors: Intissar Rouabhia, Shahid Abu Serriya, Esraa Elmaddah, Bandaly Al-Eassa, Sarah Al Harthey, and Sabrina Fawaz. To our two members who could not contribute due to horrific events in their home countries, Nisreen El Saim and Khaled Thobani, we know that you will continue to be the change makers both Sudan and Yemen need and are proud to have had you with us. We also extend our thanks to our colleagues from FES Egypt, especially Waleed Mansour, the experts who participated in the workshops, and the FES Jordan staff, in particular Farah Khalaf, Franziska Wehinger and Ronja Schiffer.

This Policy Report consists of four chapters focusing on resilience and mitigation, starting with the green economic recovery, in particular digitalization (Chapter 1), industrial restructuring (Chapter 2), technological innovation in the energy sector (Chapter 3), and urban transportation (Chapter 4). The chapters are linked and should be read as complementary recommendations for a green recovery from the COVID-19 crisis, using it as a chance to prepare for future crises caused by climate change. The conclusion summarizes the way forward.

Digitalization at the Heart of a MENA Green Economic Recovery

Author: Bandaly El-Issa

The ongoing COVID-19 pandemic has upended the global order unlike any other crisis in modern times. In addition to the massive human toll, economic activity has taken a severe hit as nations put their countries on lockdown. This has led to what economists have described as the worst global economic recession in eight decades (World Bank Group, 2020, p. 3). According to World Bank projections in June 2020, MENA economies are expected to contract by around 4.2 percent in 2020, slightly better than the global average of 5.2 percent. Although there are large national disparities among MENA countries (such as 3 percent growth in Egypt compared to a 10.9 percent contraction in Lebanon), this recession is certain to cause upheaval as the region was already suffering economically before this crisis, as evidenced by a 0.2 percent contraction in 2019 (World Bank Group, 2020, p. 91).

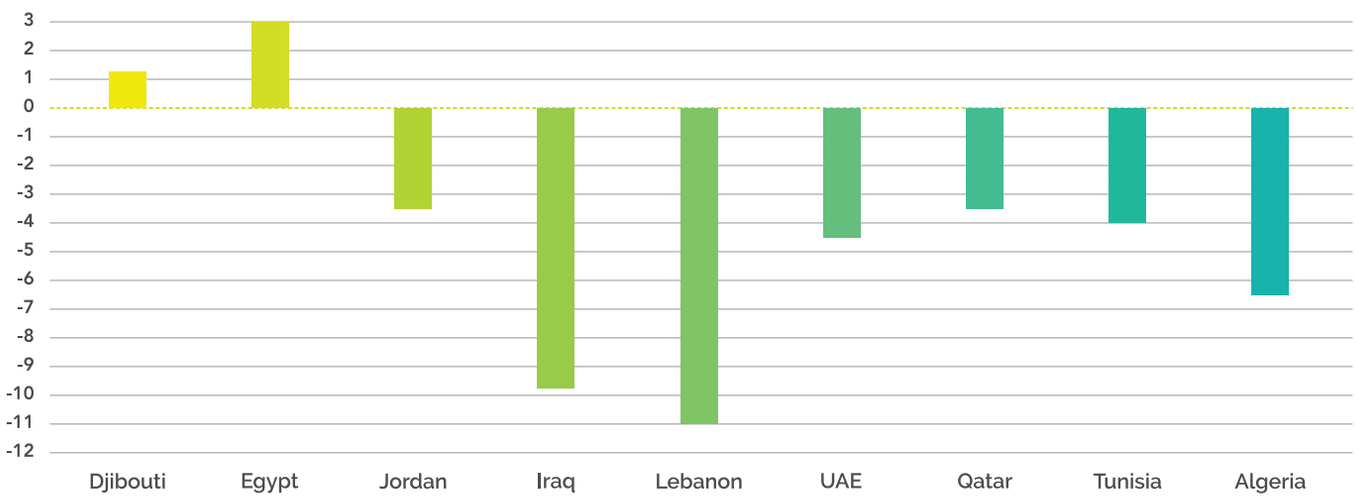


Figure 1: GDP Growth Projections of Some MENA Economies, Source:World Bank Group, 2020, p.92

A green economic recovery is being hailed as a way out of the current recession, especially in MENA countries that are facing a myriad of social, economic and political challenges. Such a recovery would not only spur economic growth, but also ensure that when economic activity approaches its pre-pandemic levels, it will be with less pollution, lower inefficiency and reduced GHG emissions as well as greater social justice (Stiglitz, 2020). This would advance the transition to inclusive, sustainable, diversified, innovative, and green MENA economies that are resilient in the face of future crises, such as those caused by climate change. In this regard, swift policy changes and the enactment of decisive measures are crucial for the success of a green economic recovery.

Digitalization, i.e. the transformation of communications, interactions, and business models into more digital ones, is a major component of many nations' green economic recovery plans. For example, the EU Parliament has called on the Commission to propose a recovery plan that "should have at its core the Green Deal and the digital transformation" (European Parliament, 2020). The argument behind a digitalization policy revolves around social distancing during pandemics in two ways: not only will climate change induce the emergence of new pandemics through habitat loss, but new pandemics will also hamper the global response to climate change by shifting priorities. Digitalization can be an effective priority area within green recovery plans to increase resilience to crises and decrease GHG emissions through minimizing commutes, business travel, etc.

Challenges

There are several challenges to digitalization as part of a green economic recovery. In particular with regards to the MENA region, there are challenges relating to digital competitiveness, digital human capital, and energy. And as much as digitalization sounds like a convenient way to conduct business, it does not offer the same person-to-person experience, which could contribute to feelings of social isolation. E-waste, cybersecurity, and privacy concerns will inevitably arise as digitalization accelerates. Lack of affordability, accessibility and equal opportunities can all challenge digital equity and inclusion.

Lagging digital competitiveness: According to the IMD research center's 2019 World Digital Competitiveness Ranking, the MENA region lags many other regions in digital competitiveness (IMD, 2020). Digitalization can enhance the attractiveness of the investment environment by curbing bureaucracy and eliminating chances of nepotism and bribery, therefore enhancing transparency and accountability. In addition, digitalization can help governments and corporations make better evidence-based decisions on budget spending and identifying policy priorities through the use of digital data collection (Nature, 2018). Digitalization of public and private sector services not only makes them more efficient, but also conserves resources such as stationary for paperwork and energy consumed in transportation when people make fewer trips. Enhancing air quality in cities due to reduced transportation emissions is another benefit. Using EN-ROADS, a climate change simulation tool, a 5 percent energy efficiency improvement annually in the transportation sector, a change commensurate with a reduction in trips due to less work traffic and business travel, causes a notable reduction in CO2 emissions starting around 2040 (EN-ROADS, 2020).

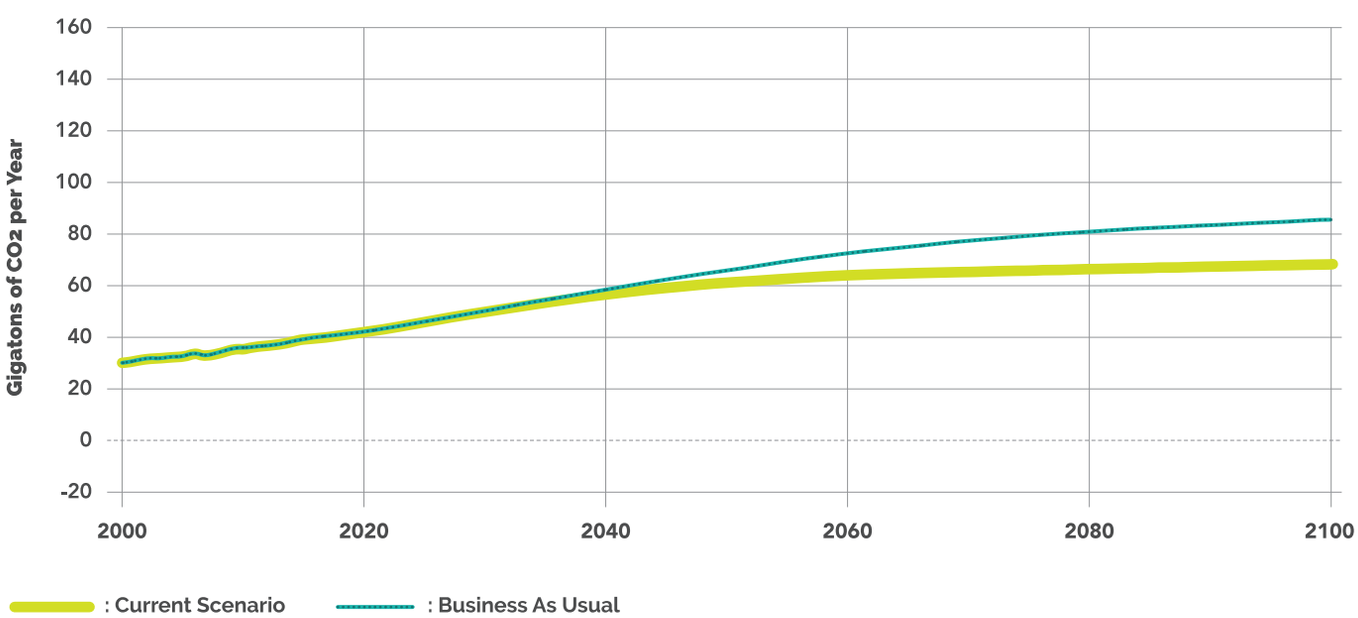


Figure 2: CO_2 Emissions Simulation with Higher Efficiency Transportation (EN-ROADS, 2020).

The MENA region has huge untapped potential for technologies such as the Internet of Things (IoT) and fifth generation (5G) networks (World Economic Forum, 2019). IoT refers to a network of interconnected devices with sensors that are capable of exchanging data and being controlled over the internet. It is an emerging technology that has numerous environmental advantages in countless applications including energy and water management, smart agriculture and homes, medical and environmental monitoring, traffic optimization, waste management (Open Source, 2020), and even in responding to natural disasters and pandemics (Singh, Javaid, Haleem & Suman, 2020). Enormous amounts of data can be generated from these applications, which then can be analyzed to drive further efficiencies (Open Source, 2020).

Shortage of digital human capital: There is a shortage of digital human capital in the MENA region, both skill and information gaps. McKinsey's 2017 Future of Work study found that only 1.7 percent of the workforce in the region is "digital talent." Meanwhile, Bayt/YouGov, a leading jobs website in the MENA region, found in a 2017 skills survey that IT jobs are among the top open positions (World Bank, 2020).

Low internet connectivity: Although internet penetration in 2019 stood at 67.2 percent compared to a global average of 56.5 percent, a number of MENA countries still lag behind the global average (Statista, 2019). Increasing internet connectivity through the construction and expansion of high-speed fiber optic networks is important to ensure that students in the region are not deprived of their right to education and that institutions and corporations can continue to do business online as usual in case of a pandemic or a climate change-related crisis. In addition, enhancing online learning and communication platforms to ensure a decent experience for users during crises is important (Sabbagh, Friedrich, El-Darwiche, Singh, & Koster, 2013, p. 35). High speed 5G networks are essential for the operation of the IoT technologies previously mentioned. Only a few MENA countries have announced plans to roll out 5G networks (World Economic Forum, 2019).

Increased power consumption could offset potential savings in the transportation sector: Digitalization will lead to greater consumption of electrical power. This increase could be due to production, usage and disposal of ICT infrastructure (direct effect) or due to economic growth as a result of energy and labor productivity (indirect effect) (Lange, Pohl & Santarius, 2020). Any potential increase in electrical power demand because of digitalization must be offset by renewable energy resources, which is addressed in-depth in Chapter 3.

Recommendations

These recommendations must consider privacy, cybersecurity, digital equity, affordability, accessibility, and equal opportunities for disadvantaged communities, both genders, and older generations.

Enhance digital competitiveness: by incorporating changes that digitalize public and private sector services, which has partly taken place in 2020 due to the pandemic. Developing and improving internet connectivity is crucial for the adoption of more IoT technologies, which have various green applications. Improving internet infrastructure to boost penetration among all segments of society and in high speed 5G networks.

Build digital human capital: changes must be made to the education systems that ensure the introduction of programming lessons early in school; the adoption of new advanced IT-related university majors such as IoT, big data, cybersecurity and artificial intelligence; incentivize youth to enroll in such majors; and offering workshops for older generations.

Ensure digital sustainability: ensure that any increase in electrical power demand because of digitalization is powered by renewable sources. An in-depth analysis on the energy transition required is presented in Chapter 3.

Reducing GHG Emissions in the Industrial Sector for a Green Recovery

Authors: Esraa Elmaddah and Intissar Rouabhia

The Middle East and North Africa (MENA) region saw a significant economic downturn caused by COVID-19. As part of the recovery from this economic setback, it is important to think about reducing GHG emissions and reflect on the environmental impact of the recovery across all sectors. A green economic recovery not only entails digitalization and increasing resiliency, but also reducing GHG emissions to prevent climate change and reduce harm caused by its related crises. Another important path to green recovery is restructuring the industrial sector in the MENA region in a way that will both improve performance and also comply with environmental regulations. In the industrial sector, mitigation measures and steps to reduce GHG emissions face many barriers such as high cost, ineffective technology, technical risks, and insufficient policy support (IPCC, 2014, p.775). In particular, industrial resource efficiency presents multiple interconnected challenges and opportunities.

In recent years, resource efficiency and the low-carbon economy have emerged as central themes in global discussions on the transition to a green economy (European Environment Agency, 2020). For the MENA region, there are certain sectors that should be prioritized for "going green."These include transportation, construction, and industry, given that industrial emissions represent 30 percent of total global GHG emissions (IPCC, 2014, p.745). In the MENA region, the industrial and transportation sectors are leading contributors to GHG emissions after electricity generation (Karagualian et al, 2015). In MENA countries, the transportation sector was responsible for 558.6 MTCO2 Eq. of all GHG emissions in 2016 (Graph1), while industrial GHG emissions reached 253.94 MTCO2 Eq. Also in 2016 (Graph2), manufacturing and construction alone was responsible for 402.4 MTCO2 Eq.

The International Energy Agency (IEA) expects global industrial emissions to fall about 8 percent compared to 2019, the largest annual drop since the Second World War (IRENA, 2020a). Daily emissions worldwide in the first week of April were 17 percent lower than a year earlier (IEA, 2020). The Paris Agreement[1] aims to hold the increase in the global average temperature to 1.5˚C above pre-industrial levels. And while the COVID-19 related drop may seem to make this goal easier to reach, it would require similar annual declines for ten consecutive years (IEA, 2020). However, it is expected that GhG emissions will surge back to pre-pandemic levels as countries reopen. In fact, the region's annual emissions amount to 3.28 Gt (2016) (CAIT,2019). As mentioned in Chapter 1, the transportation sector accounts for over half of the recent emissions reduction, the steepest drop of any sector. On the other hand, emissions from materials production now total those from agriculture, forestry, and land use changes combined, thus making reductions from this sector a high priority. (IRP,2020)

1 Paris Agreement, Paris Climate Agreement, or COP21, an international treaty named for the city of Paris, France, in which it was adopted in December 2015. The deal aimed to reduce the emission of gases that contribute to global warming.
For more information about the Paris Agreement see:
https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

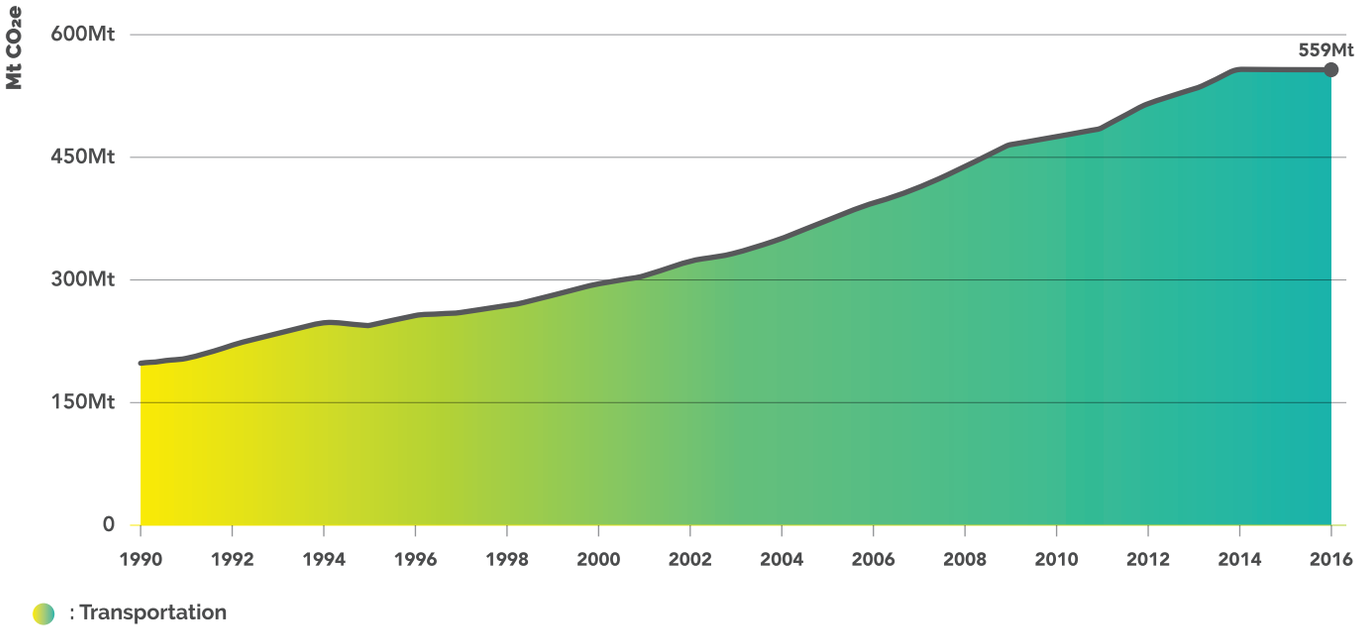


Figure 3: Historical GHG Emissions for Transportation in the MENA Region from 1990 to 2016 (CAIT,n.d)

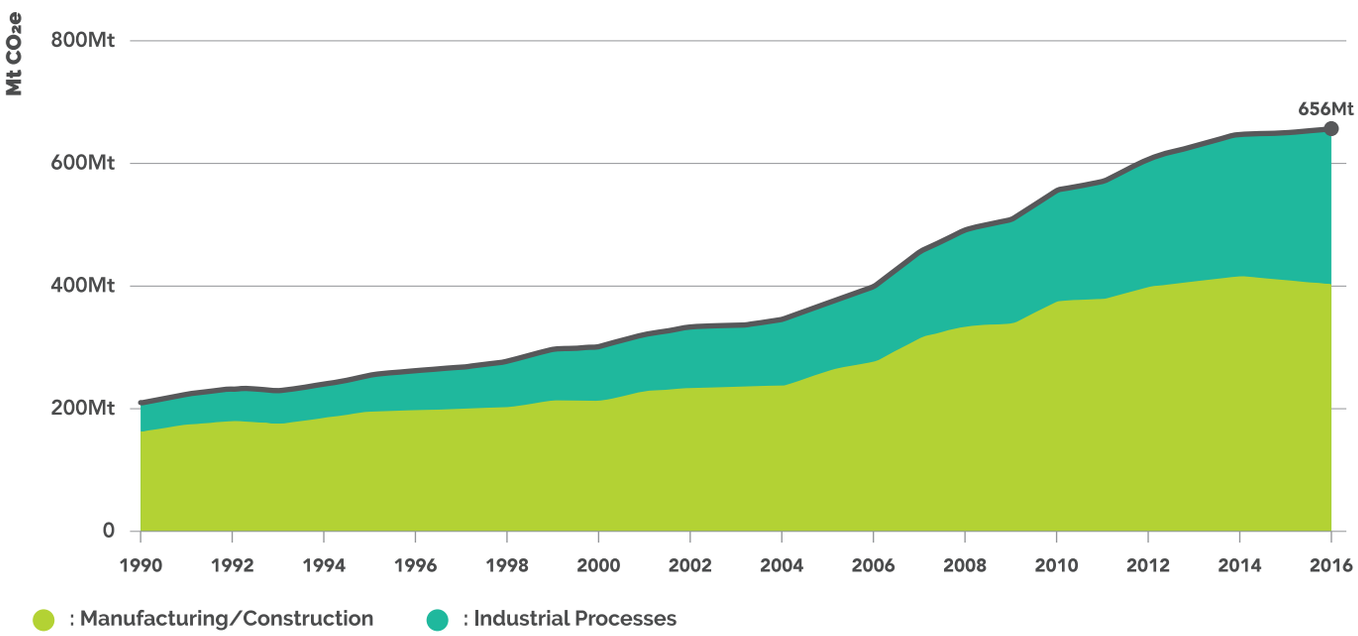


Figure 4: Historical GHG Emissions for Manufacturing, Construction, and Industrial Processes in the MENA Region from 1990 to 2016 (CAIT,n.d)

Alongside transportation (Chapters 1 & 4) and an energy transition (Chapter 3), a focus on industry is a key to reducing energy resource use and achieving GHG emission cuts. To reach the Paris Agreement's 1.5˚C target, it is vital to increase resource efficiency in the industrial sector, as it is a critical source of GHG (IRP,2020). Examples of globally tried-and-tested policies for the industrial sector include but are not limited to: resource efficiency standards for firms, end-of-pipe technologies and pricing pollution/carbon (or removing perverse subsidies for pollution and carbon).The challenges that the MENA region faces in the industrial sector, including financial and technical limitations and ineffective regulatory and legislative framework need proper analysis and localized industrial solutions. These include efficient deployment of available technologies, access to financing, and enforcement of emission reduction regulations. By implementing such regulations, providing industrial incentives, and monitoring GHG emissions closely, a green recovery in the MENA industrial sector can reform this vital economic sector while also boosting resilience.

Challenges

The MENA industrial sector is underdeveloped, and this condition contributes an important share of GHG emissions in the region. The region's oil and gas industry burns an estimated 40 percent of all flared gas annually, making it the largest flaring region in the world (World Bank, 2020). Industrial activities in the region also contribute to air pollution, chiefly petrochemical complexes, fertilizer plants, refineries, cement factories, and iron and aluminum smelters (Abbass, Kumar, and El-Gendy, 2018,p.34). In Syria, for example, craft industries such as tanneries and textiles use highly polluting technologies (Abbass, Kumar, and El-Gendy, 2018,p. 34). As a developing region, the Middle East and North Africa also faces challenges in boosting the competitiveness of its local markets and accessing international markets. Low levels of MENA manufactured exports are partly due to the need to conform to international environmental standards, which results in a negative feedback loop that depresses exports further.

The first major challenge facing the MENA industrial sector is the growing number of energy intensive industries. Egypt's low electricity rates, for example, incentivize the growth of energy-intensive industries in Egypt (El Khoury, 2012). Similarly, the availability of energy in the Gulf at subsidized rates has attracted investors to energy-intensive industries such as steel, aluminum, and fertilizers (El Khoury, 2012). The policy of cheap, subsidized electricity spurred these industries and thus increased GHG emissions in the region. Gradual subsidy reforms began in 2015, however the phase-out will take years before prices rise to levels seen in other countries (Menichetti, E., El Gharras, A., Duhamel, B., & Karbuz, 2019). Following recent gas discoveries, many countries in the region have switched to natural gas as a primary energy source, which will accordingly have a negative effect on expanding energy intensive industries. This shift will produce large energy-related emissions (GHG and pollutants), in addition to the environmental toll from production processes and material management itself (OECD,2018,p. 3).

On the other hand, there is significant potential to use carbon capture and storage (CCS) in energy intensive industries like cement production, iron and steel, and petrochemicals, especially in the GCC (IPCC,2018,p.7705). Qatar, for example, has taken serious steps towards adopting in recent years starting with the research and development phase, and later establishing a national CCS framework (Meltzer, Hultman and Langley, 2014,p. 24). In 2019 Qatar opened the largest carbon recovery and sequestration plant in the region with a capacity of 2.1 million tons per year ("Qatar Opens Largest Carbon Recovery Sequestration Facility in the Region",2019). See Chapter 3 for further discussion of CCS outside the industrial sector.

Another challenge to cleaner industrial activity in the region is the use of new resources instead of recycled and reusing previously produced materials. The extraction and use of primary (raw) materials is much more polluting than secondary (recycled) materials (OECD,2018,p. 3). Resource efficiency opportunities can be applied in the industrial sector to limit GHG emissions, for example, recycling, remanufacturing or even reuse of industry waste and off cuts. This can reduce the amount of raw materials used in manufacturing as well as industrial waste and energy usage. The raw materials saved through remanufacturing and other methods can reduce energy used, and thus the emissions generated by the extraction of materials and their processing. Exchange of industrial waste material is one such solution; it was applied in India in various industries through a partnership between the Confederation of Indian Industry and the EU. This initiative included creating a website as a platform for waste generators to register their waste by type and quantity. This has been applied in the cement industry by using other industrial wastes as raw materials forcement production ("CII Waste Material Exchange," n.d.).

Plastic recycling also represents a major challenge in the MENA region. The Middle East alone is responsible for about 8 percent of global plastic production and plastic waste is surely a source of greenhouse gas emissions (Zafar,2020). Recycling plastic is vital to sustainable plastic waste disposal as it reduces the amount of energy and natural resources (such as water, petroleum, and natural gas) needed to create virgin plastic. Nevertheless, plastic is much more difficult to recycle than materials like glass, aluminum, or paper (Zafar,2020). In addition to the complex technology required for plastics

recycling, the cost recovery rates are modest (Weber, B., Kroll, J.,2019). Consumer pressure can play an important role in pushing for more recycling. But the largest opportunity for driving increased recycling lies in stricter government environmental regulation. Governments can also help by providing incentives and further encouraging industrial investment in green projects, including recycling, that limit emissions and preserve natural resources (Abbass, Kumar, and El-Gendy, 2018,p. 37). To incentivize such solutions, tax relief can be given to facilities that use a higher percentage of recycled materials, while charges can be levied to discourage the use of raw materials or virgin plastics.

Recommendations

Set a benchmarking framework for resource efficient industries, with a focus on energy intensive industries such as steel, aluminum, fertilizers,etc: This framework will guide industrial facilities to implement resource efficiencybest practices. Comparing the status quo of industrial processes to best practices will identifyareas for improvement. Close monitoring will guarantee that these industries will follow the developed framework to reach resource efficiency best practices. Consistent evaluation of industrial plants will also be crucial to limit emissions, for example fugitive emissions.

Incentivize reuse and recyclingin industrial processes to reduce GHG emissions: Introduce financial schemes to provide funds to increase reuse and recycling in industry. A revolving fund can be established based on tax relief and/or fees. This should be done in cooperation with countries that have successful experiences like Germany or international organizations like UNIDO and the IFC. This can also include developingpolicy regulations for industrial waste management and promoting waste exchange between different industries to reuse industrial materials produced (e.g. metals, textiles, leather). This should be done through a solid base of regulation but, most importantly, backed up with a legislative framework that is reinforced by a plan to facilitate the exchange process.

Create a specialized certification body for recycled materials (glass, plastic, metals, etc.) This entity should control the recycling and material exchange processes and accredit firms and factories with a quality scheme, which should give credibility to accredited bodies. The certification body would give an assessment based on the international standards such as ISO 15270:2008 for the Recovery and Recycling of Plastics Waste and ISO/TR 17098:2013 Packaging Material Recycling. Regulating waste recycling and developing adequate local standards to manage the recycling industry would standardize the operations of waste recycling companies. In addition, providing government support to small and medium scale recycling plants would create additional economic benefits.

Introduce a GHG emissions tool for each country in the MENA region, based on the need and specific conditions, modelling and monitoring. This will serve as a decision-making tool for the ministries to control, predict and limit GHG emissions.

- Promoting access to information in the region and providing updated information about emissions levels in the MENA region.
- Adopting a multidisciplinary approach to provide scientifically valid information and statistics on which policymakers can base their policies and decisions.
- Support local initiatives and replicate successful experiences from the region for example expand data platforms for better access to information.

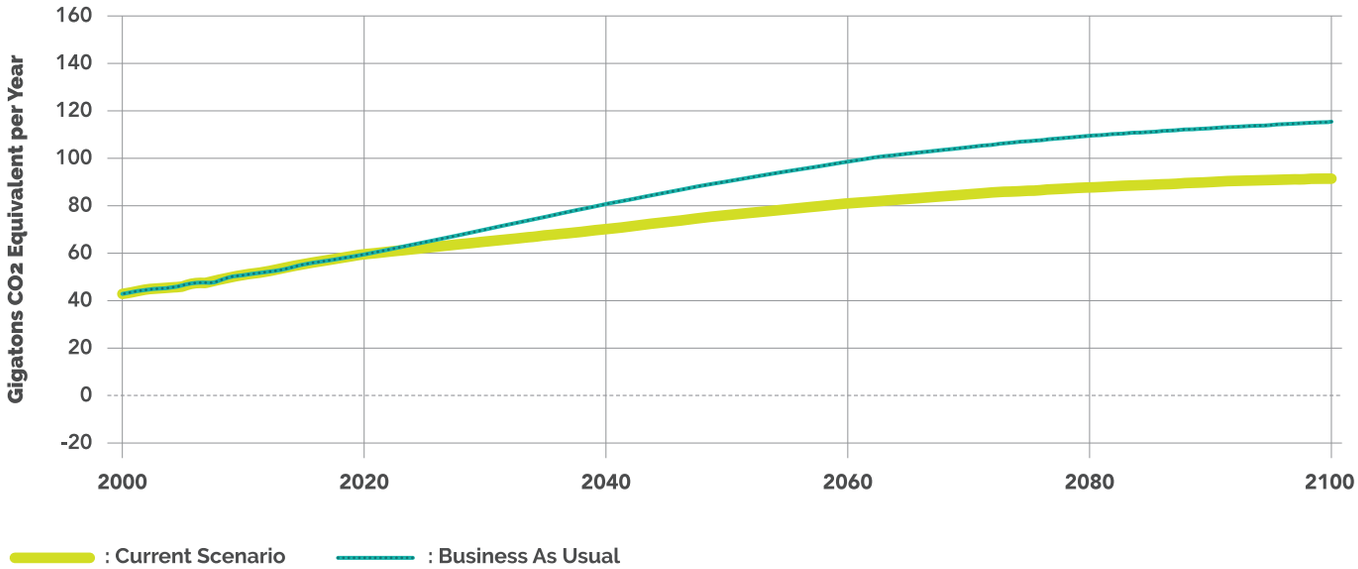


Figure 5: Greenhouse Gas Net Emissions Changes Simulated on EN-ROADS (EN-ROADS, 2020)

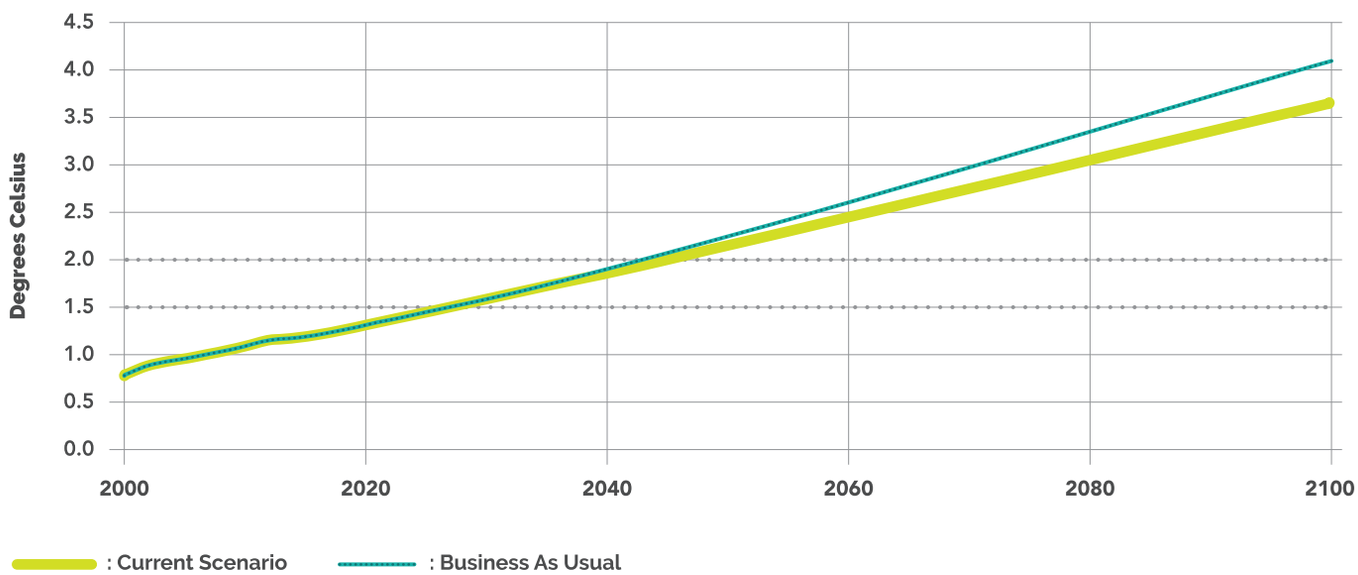


Figure 6: Temperature Change Simulated on EN-ROADS (EN-ROADS, 2020)

Recycling and reprocessing plastic waste into materials usable by other industries is one example of the potential of material recycling in GHG emissions abatement. Based on the EN-Roadsclimate interactive policy simulation tool (EN-Roads,2020) industry non-CO2 GHG emissions would decrease by 20 percent as a result ofimplementingthe second recommendation above on reuse and recycling. CO2 emissions are projected to decrease by 30 percent if the industrial CCS solutions outlined in Chapter 3 are introduced and the industrial sector adopts best practices around reuse and recycling, in addition to setting a carbon price of$20per ton. These steps would reduce GHG emissions by almost 20 gigatons compared to the current projected scenario, shown in Figure 2. In this scenario, the global temperature increase will reach 3.6˚C, a decrease of 0.5˚Cfrom the current scenario. This simulation showed that the suggested policy recommendations can have a remarkable impact on climate and also highlighted the importance of enacting such policies for a balanced green recovery.

Green Technologies and Fuels for Recovery and Growth

Author: Sarah S. Alharthey

Green recovery is shaped by investment in the future and funds flow to sustainable sectors that support the environment and climate (UN,2020). As shown in Figure 1, an economic recovery tilted toward green stimulus and cuts in fossil fuel investments can avoid future warming of 0.3˚C by 2050 (Forster et.al,2020). Green stimulus prioritizes clean energy that relies on green fuels and energy technologies. Adopting science-based net-zero strategies and investments is a bold long-term policy and evidently will create a 100 percent green energy system that will accelerate the transition to carbon neutral mobility and heavy industry (Mendiluce,2020). Looking at recent history, a green stimulus package aided South Korea's swift and successful recovery from the 2008 recession. In this case, 80 percent of South Korea's stimulus spending went to climate-friendly policies, energy efficiency technologies, and RE development (Bloomberg,2020). And today, The European Green Deal is the EU's recovery strategy (European Commission,2020) and EU Energy System Integration Strategy is centered on Renewable Energy (RE), circular energy system, and low carbon fuels. The strategy identified offshore wind, biofuel, green hydrogen, synthetic fuel, hydrogen-fueled steel plants, carbon capture and storage (CCS) &electrical vehicles (EV) as the most promising technologies to adopt.

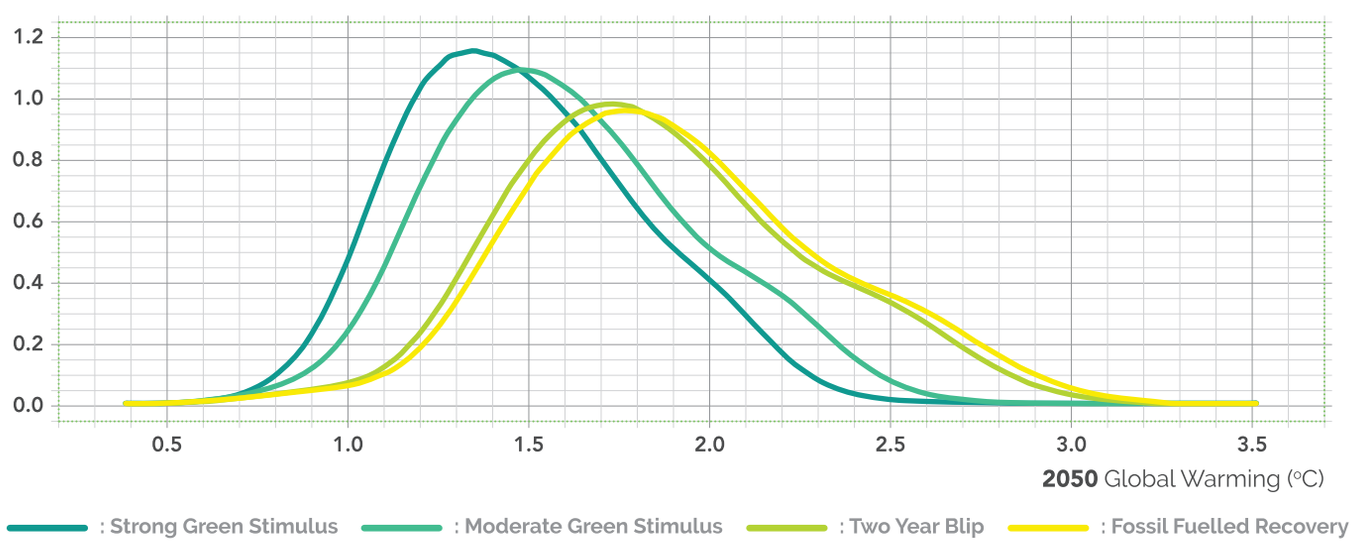


Figure 7: Pathways to Green Stimulus Impact (Forster et.al, 2020)

The role of technology in combatting climate change through mitigation and adaptation has been acknowledged by the United Nations Framework Convention on Climate Change (UNFCCC) (Charlery et.al, 2018). National Determined Contributors (NDC) are reported to the UNFCCC to show country-level commitments on climate action. Nevertheless, the MENA region's NDCs do not specify environmentally sustainable technologies and states lack the ability to structurally formulate national plans. (Rahman et.al, 2016). The Technology Mechanisms under the Paris agreement, TEC and CTCN, are a starting point for the region to conduct its technology needs assessment (TNA) (Charlery et.al, 2018).

Arguably, technology is the low hanging fruit to deliver the needed emissions cuts and must be at the center of climate change mitigation and adaption planning, especially in the MENA region where GHG emissions are an area of concern, as discussed in the previous chapter (UNFCCC,2020). Since the MENA region is set to submit updated NDCs in 2021, this is a key opportunity to enact post COVID-19 long term green recovery initiatives and embrace improved technologies.

Renewable Energy

RE is a mature industry with a long-term growth trajectory that appears intact despite the pandemic (Deloitte,2020). Renewables currently account for 35 percent of total world generation capacity as of 2019 (IRENA,2020). The MENA region is one of the fastest growing worldwide in RE projects. In 2019 RE in the region saw a growth of 12.6 percent, nonetheless, the total capacity stands at only 23 GW (1 percent of global production), accounting for 26 percent of net additions(IRENA, 2020). This slow adoption rate comes in spite of the region's high natural resource potential in terms of wind speed and solar irradiation levels (GENI,2007). Modern technology presents an opportunity to achieve energy transition goals to RE at a record low cost by taking advantage of the declining levelized cost of electricity (LCOE) (WEO,2019). For instance, between 2010 to 2019 utility-scale PV cost declined sharply by 82 percent; similarly CSP prices fell by 47 percent, and onshore and offshore wind fell by 39 and 29 percent respectively (IRENA,2019).

Challenges

Integration of RE power planning and policies in the MENA region are insufficient and lagging globally (Table 1) despite falling costs and conditions favorable to renewables adoption. This is exacerbated by lack of skilled labor for RE implementation, insufficient training, and dependence on imports (Oxford,2014). MENA countries require policy well to institute work towards assessment of resources, technological needs, local empowerment, devising a promising pipeline to attract investments.

Practices for integration of VRE into long-term planning	Countries
Advanced practices already in place. Availability of adapted simulation tools and methodologies, trained staff to carry out the required tasks on a regular basis.	**Algeria, Morocco, Qatar, Saudi Arabia**
Initiation phase. Some practices exist. Knowledge-gathering process is ongoing (RE resources mapping, measurement stations, capacity building, etc.) RE integration objectives taken into account in long-term planning.	**Egypt, Iraq, Jordan, Lebanon, Libya, Oman, State of Palestine**
RE integration process into planning not yet started. (No practices in place. Sometimes, long-term renewable energy integration objectives are defined.)	**Bahrain, Somalia, Sudan, Yemen**

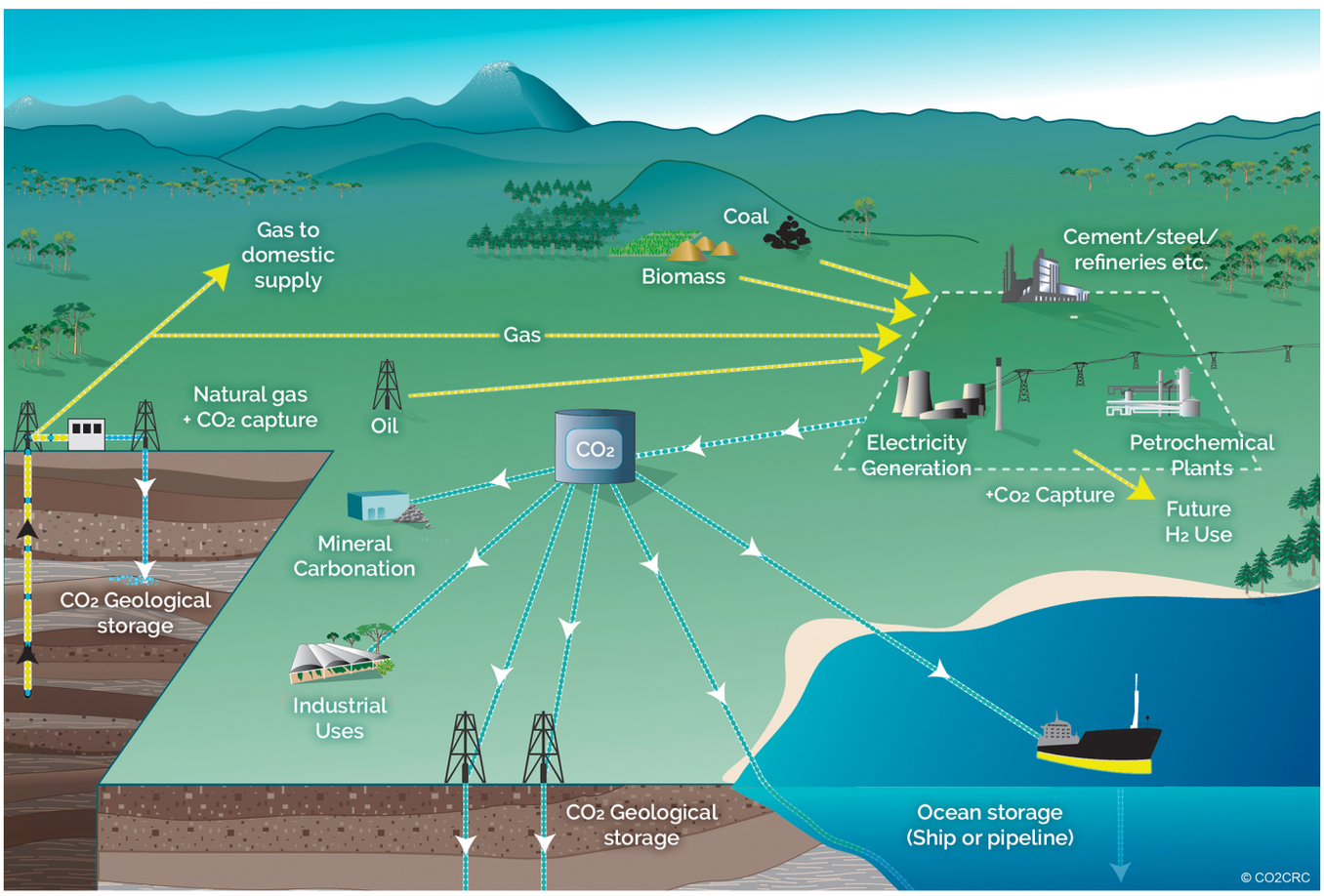
Table 1: MENA Current status of Renewable Energy long term planning (IRENA)

Grid and Storage Technologies

Installing smart, resilient transmission and distribution (T&D) power infrastructure will help utilities to respond to consumers, suppliers, and prosumers effectively while also eliminating waste (Bloomberg,2020). This is crucial to dealing with the fluctuations of RE and can supply electricity even when no wind or solar energy can be harvested. Matching RE supply with energy demand necessitates a long duration bulk storage (e.g.lithium-ion batteries) to maintain reliable service (Deloitte,2020). Around 10 GW of storage deployed globally in 2017 have proven value, yet only two projects have been developed in the UAE and Jordan. Deploying an effective storage system would be a key driver of increased grid resilience in the region.

Challenges

Current MENA transmission & distribution grid is substandard (Zhang,2017) with the electricity losses in 2016 measured at 12.1 percent, which is 150 percent of the global average (IEA,2017). Cases from the region include Lebanon facing electricity supply balance issues, Jordan importing energy and overloading its T&D grid with unplanned high RE penetration, Egypt is suffering from electricity surplus, and Morocco planning to generate 42 percent RE by 2020 that will add a pressure on the grid infrastructure. Meanwhile, upfront costs of battery storage are considerably high with a deficient regulatory framework, lack of a T&D investment plan, and an absence of pilot projects to validate the technology efficacy as a solution for the energy challenges.



CCS	CCU	CO_2-EOR	DAC	BECCS
Sequestration	Utilization	Oil reservoirs	Direct Air Capture	Bio Energy CCS
Geological	Chemicals/cement	EOR (+)		

Figure 8: Carbon Elimination Technologies, Source: IPCC

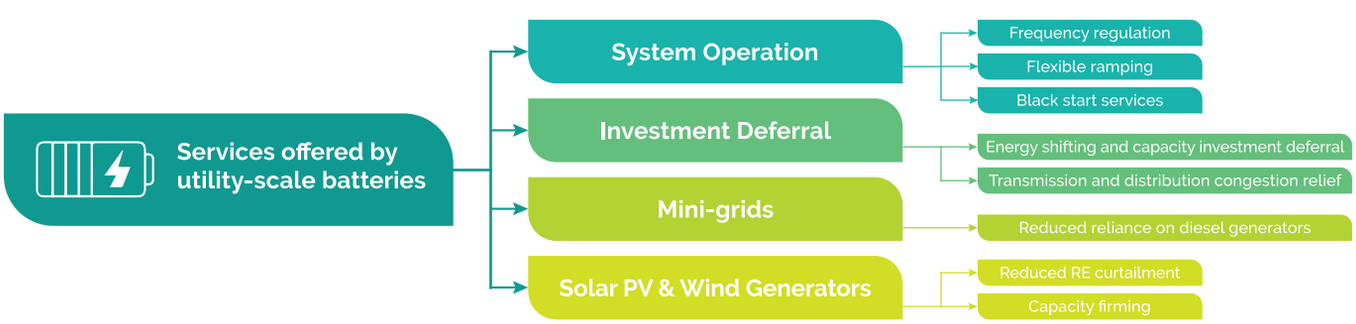


Figure 9: Services Offered by Utility -Scale Battery Storage Systems (WEO,2019).

Carbon Capture, Utilization, and Storage (CCUS)

Tackling emissions from existing assets would require the technology of carbon capture utilization and storge as shown in Figure 4. Instead of, CCUS is a process to eliminate CO2 from fossil-fueled industrial and power plants, which account for two thirds of power generation globally(IEA,2020). CCUS is a solution when Early retirement of assets is challenging due to meeting base load demand and restrictions with stakeholders. Current operating plants capture around 90 percent of CO2 generated (IDB,2016). All pathways to reaching the 1.5˚C target in the Paris Agreement employ CCS technologies (IPCC, 2018). MENA oil producers contribute to global emissions and including CCUS in planning the stimulus packages could give CCUS an important boost and significant CO2 reductions. MENA oil producers can afford to invest in CCUS deployment achieving carbon neutrality and supporting the technology to become commercially feasible.

Challenges

Despite recognition that CCUS is an important part of the portfolio of emissions mitigation technologies, it is held back by higher operating costs and an absence of measures to address cost.

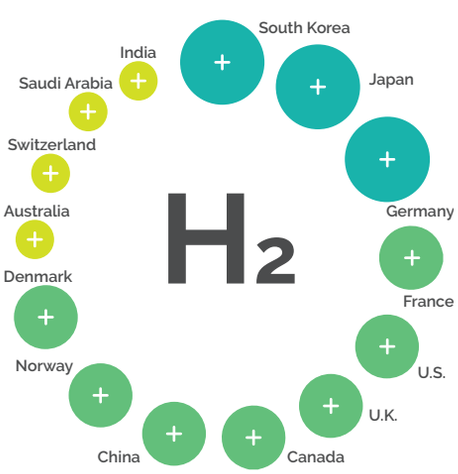


Figure 10: Today's Largest Hydrogen Economies (BloomberNEF)

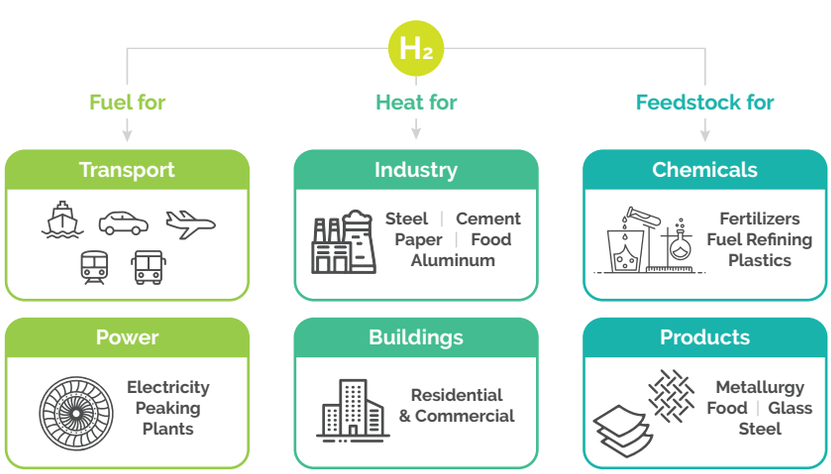


Figure 11: Hydrogen Applications (Bloomberg NEF)

Green Hydrogen

Hydrogen is produced by separating oxygen from hydrogen in water molecules through electrolysis technology. The process requires a third of the total water consumed by traditional fossil fuel production (EC,2020). Green Hydrogen is produced with RE as an energy source. Hydrogen is an energy carrier and a versatile fuel in terms of supply and use (Figure 5). Hence, it plays a major role in filling the gap left by fossil fuels in tackling decarbonization of long-haul transport and the energy-intensive chemical and steel industries.

Fossil fuel-based grey hydrogen is currently used for oil refining, producing ammonia, methanol, steel, and as a feedstock. For instance, the MENA region's share of the petrochemical market is around 10 percent (GVR,2020) and the region remains a major exporter of ammonia, led by Egypt (World Fertilizer,2018). Additionally, MENA steel production is estimated at $74.8 billion (MRFR,2018). A green hydrogen economy could meet a quarter of the world's energy needs by 2050 (BloombergNEF,2020) and several countries have begun initiatives in this direction (see Figure 10.)

The United States has budgeted $64 million to scale up hydrogen production (EC,2020).The EU announced a robust pipeline of investments to install 6 GW of renewable hydrogen electrolysers with production of 1 million tons of hydrogen (EC,2020). Germany has adopted a national hydrogen strategy as well, with production capacity of 10 GW by 2040 and €7 billion investment (Schulz,2020), some of which is slated for the MENA region. Hydrogen power leaders like Japan and Germany see potential in the MENA region for expanding international collaboration, technology transfer, capacity building, as well as a new market for green fuels.As investments begin to provide returns and RE prices keep falling, green hydrogen could become competitive with grey hydrogen as early as 2023 (MorganStanley,2020). Global investments, for example through the EU, will allow the region to access the technology within the coming three years at a reasonable price.

Challenges

Although 48 percent of the world's desalinated water is produced in the MENA region, water shortages persist, and any project planning should carefully account for social and environmental impact. It's worth noting that storage, maritime transport, and electrolysis technology is still maturing at commercial scale. Hence, the efforts to retrofit and build the infrastructure for the technology chould start now and capture a growing share of the RE market.

Recommendations

- Create a Multi-Stakeholder Task Force to assess national and regional technological needs and regulatory barriers for deployment of of energy technologies like RE, grid storage and CCUS and the incentivize regimes for decarbonization pathways.

- Prioritize International Cooperation to position the region as a clean energy source and build partnerships with advanced countries in Asia for technology transfer. Given Europe's proximity and the multilateral relations (e.g. the Africa-Europe Green Energy Initiative), partnerships on export of hydrogen and RE can realize Europe's goals while MENA benefits from technology transfer and capacity building. Morocco, for example, would be a prime location for a green hydrogen partnership.

- Develop Policies to Encourage Public Private Partnerships allowing flow of investments for green technologies. Vulnerable countries can opt for green financing and concessional loans (e.g. OFID)to help fund vital infrastructure projects at favorable terms.

- Promote Innovative Technologies through human and institutional capacity building, dissemination of knowledge and tools for the public and private sectors to play a role in research, development, and demonstration.

Sustainable Mobility Toward Urban Resilience in MENA Cities

Author: Shahd Abu Serriya and Sabrina Fawaz

The pandemic caused by COVID-19 has crippled the global economy and upended people's lives, thereby threatening sustainable development across all dimensions (UN-Habitat, 2020). Densely populated cities increase the risk of spreading the virus due to close proximity among residents and the challenges to implement required social distancing (UN, 2020). This presents an acute risk in the MENA region's cities, where an estimated 62 percent of the total population reside, with the total urban population expected to double by 2040 according to UN estimates (Avis, 2020). The high density urban population as well as the fast spread of COVID-19, especially in cities, has made MENA governments take rapid and decisive measures to slow the spread of COVID-19 by limiting the movements of hundreds of millions of people, especially within cities (Conde & Pataud, 2020). These drastic confinement measures caused an unprecedented contraction of economic activity, a collapse in demand for oil products, and unintentionally, a drop in greenhouse gas emissions and air pollution. Unfortunately, this drop proved to be short lived, with global transit mobility data showing a rebound.

The recovery from COVID-19 should be an opportunity to future-proof economies: for cities to clear their air, green their open spaces, and embrace solutions that help decarbonize and drive down resource use and related impacts on ecosystems while creating new jobs (UNEP, 2020a).It is clear that sustainable urban development is the way forward for cities to mitigate and adapt to climate change, as it raises the need for governments in the MENA region to take decisive actions to increase resilience of cities and to decrease their ecological footprint. One key aspect of this is to transform the mobility sector, in particular transportation. During the ongoing pandemic, ridership and revenues of public transportation and taxis/ride hailing in the MENA region have witnessed a serious decline. This is a worrisome trend considering that most MENA cities suffer from traffic congestion that not only threatens the health of MENA citizens, but also their access to jobs, health support and essential services (UN, 2020).

This raises the need to provide safe mobility today and to start planning the sustainable urban mobility of tomorrow, learning from the experiences gained from the pandemic and previously recognized best practices. In Jordan, more than 47 percent of women have declined a job opportunity due to lack of access to safe, accessible and affordable public transportation (Aloul et al., 2018). Hence, urban resilience and sustainable mobility are critical to ensuring freedom of movement and access to jobs and services that enhance urban development and the quality of life of citizens.

Challenges

Cities of the region, such as Amman, Beirut, and Cairo, are facing several challenges related to transport that directly affect urban quality of life. Underdeveloped public transport, fossil fuel dependency, and transport emissions are often cited as contributing to unsustainable transport systems in the region. We address each in detail below.

Underdeveloped public transport: The level of urban public transport development varies across the region, mainly due to the disparities in availability of financial and natural resources as well as the level of political stability in MENA cities (Smart et al., 2016). UITP examined the daily trips within four major MENA cities: Abu Dhabi and Dubai (UAE), Amman (Jordan), and Casablanca (Morocco).

Their research showed the negative impacts of high car ownership throughout the region: higher car ownership and larger motorway networks were associated with lower public transport use (UITP, 2016). The absence of reliable public transport, as well as poor planning for neighborhoods led inhabitants to rely more heavily on private automobiles during the pandemic. This includes private cars, taxis, and in some cases various types of informal public transport, mostly operating poorlymaintained vehicles (IGC, 2020).

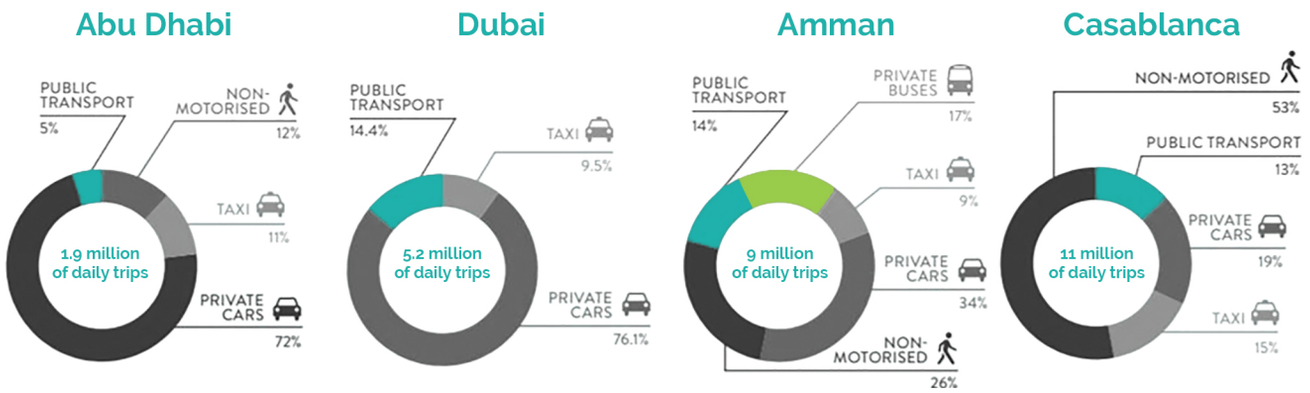


Figure 12: A Comparison of Transportation Means in Different MENA Cities (UITP, 2016)

Fossil fuels dependency: The MENA transportation sector is highly dependent on motorized gasoline and diesel-powered vehicles (UITP, 2016). This high dependence on fossil fuels further increases GHG emissions and contributes to climate change. The MENA region's existing vulnerability to climate change and natural disasters has exacerbated the impact of COVID-19 (OECD, 2020). Given that the current pandemic directly threatens physical and economic health, it is not surprising that attention has shifted away from climate change mitigation and transport emissions reduction. According to the UN-Habitat, only a few cities in the region have invested in sustainable urban mobility, due to the availability of cheap, subsidized fuel and the lack of resources (UN-Habitat, 2017). Current low oil prices also discourage an energy transition and reduce incentives for achieving energy efficiency (ERIA, 2020).

Transport emissions: The number of vehicles in MENA countries has been increasing, leading to greater consumption of fuel, traffic congestion, and more emission of greenhouse gases despite global efforts to reduce them (ESCWA, 2015). A report by Greenpeace showed that air pollution levels, mostly caused by the transportation sector in the MENA region are high, where Lebanon and Egypt have the highest rate of premature deaths attributed to air pollution and fossil fuel use among the region (Naciri & Hassani, 2020). These high levels of air pollution pose a particular concern in the current pandemic. In fact, studies show that increased levels of fine particulate matter (PM2.5), high levels of which are a known health concern, are associated with an increase in the COVID-19 death rate (OECD, 2020). Furthermore, confinement measures can result in increased exposure to indoor air pollution, particularly for people relying on polluting fuels for cooking and heating in poorer MENA countries and in buildings lacking, or with poor, ventilation systems (OECD, 2020).

Recommendations

Avoid or reduce the need to use transport: The development of integrated policies should ensure that spatial planning and land use are consistent with socioeconomic, and environmental priorities to achieve urban resilience. MENA governments should rethink the urban planning of major cities and create more pedestrian and cyclist friendly cities that reduce air pollution and congestion. A nexus approach, recognizing the linkages between land, food, energy, and water can contribute to more equitable urban

development in the region. Urban planning strategies and policies should also aim to preserve valuable resources, protect environmentally sensitive areas, and provide adequate green spaces. Dispersing transportation demands to city sub-centers and core cities will relieve congestion, decrease travel distances to vital destinations, and reduce the need for commuting and thus air pollution.

Shift to active and sustainable transport: Major cities of the MENA region need toadopt an urban development model that favors public transport, walking and cycling as resilient and contactless transport modes. Recognize that a green recovery is contingent on a significant shift from near-completereliance on the automobile and informal public transport, to the provision of a modern, organized multi-modal public transport system. This can include the introduction of metro and rail, the application of fuel saving and other vehicle standards, scrapping old vehicles, and the adoption of lead-free and low-sulphur diesel standards. Multi-modal transport systems should emphasize walking/cycling and organized modern high-capacity forms of transit.

Improve transport technologies: Incentivizing innovation in sustainable technologies can continue to bring down the cost of renewable energy sources and decrease dependence on more polluting sources. Investment in sustainable, low-emission forms of transportation need to be scaled up in the MENA region within the recovery plan to protect the well-being of urban residents, while financing of technological solutions can optimize the reliability and the cost effectiveness of mobility and reduce air pollution. Applying innovation in public transportation and advocating various types of electrification willmitigate fossil fuel-linked price fluctuations and place resiliency at the heart of the transportation sector.

It was estimated before the pandemic that global emissions would need to fall consistently by 7.6 percent each year between 2020 and 2030 in order to reach the 1.5˚C warming objective enshrined in the Paris Agreement (UNEP, 2019b). However, post-crisis emissions may change this equation, as temperature changes are highly sensitive to the mode of recovery. To assess this, we used the (EN-ROADS, 2020) simulator to address the impacts of implementing sustainable mobility strategies such as energy efficiency and electrification of transport in the recovery package in the short- and medium-terms. Major changes in the simulation are related to shifting from oil, coal, and gas to renewables and new technologies, specifically in the transportation sector. Analyzing the effects of implementing such strategies, the temperature curve is expected to reach the target levels at 2.9˚C, as shown in the graph below.

Figure 13: Global Emissions and Rise in Temperature

Conclusions

Author: Ronja Schiffer

In closing, it is essential to outline the steps that will be made towards follow up.Going forward, the group of experts will continue to advocate for these recommendations, a sustainable energy transition,and increasing resilience to climate change throughout their careers, as well as through FES. Most immediately, they will meet with decision-makers, advocate at the next COP in Glasgow, present their ideas regionally, and search for dialogue. COVID-19 has led to a tragic loss of life, nevertheless it presents a chance to change behavior and increase resilience so that future crises related to climate change will be less catastrophic. Immediate action is needed globally, regionally, and locally.

This policy paper has been written with a recognition of the need for increased resilience as a result of COVID-19 and in preparation for future climate related crises. The MENA region faces a lack of resilience as a result of climate change, economic recession, lack of sustainable long-term policies, as well as reliance on outdated technologies. This paper argues that the solution is to implement sustainable and resilient solutions as part of a green economic recovery program focused on digitalization, sustainable technology, increasing local and regional capacity through participatory processes and changing societal behaviors in the MENA region and beyond. This can be achieved by enabling the shift to sustainable technologies such as green hydrogen and circular resource use, shifting to reducing resource use, e.g. by digitalizing work and education, and shifting from fossil fuels to renewables by providing well planned and sustainable policies and regulations to reduce GHG emissions and enable a green economic recovery fromCOVID-19. This will enable higher resilience to withstand future crises while also helping to mitigate climate change.

Key aspects of this futureinclude a green economic recovery through digitalization (Chapter 1) and rethinking the future of work the need to commute in private vehicles. Alongside this, industrial reform and the circular economy (Chapter 2) will reduce demand for natural resources, reusing and recycling used materials instead of extracting increasing amounts. Furthermore, technological advancements (Chapter 3), movingtowards renewable energy, energy efficiency, and new green fuels like green hydrogen can be powerful tools to advance the region's economies. Finally, switching to alternative mobility and land use in MENA cities will not only decrease emissions but also increase access to cities, social justice, and resilience (Chapter 4). As these chapters have shown, some changes do not require large amounts of money but rather changes in planning and cooperation between private and public entities, as well as international players.

The EU Green Deal, green growth and green economic recovery plans are already planned and implemented. It iscrucial to avoid recovery programs similar to the one adopted after the 2008 financial crisis, which prioritized support to energy-intensive fossil fuel-based industries and lacked a clear focus on investments in cleaner alternatives. There is willingness to cooperate.The EU is actively seeking cooperation with neighbors such as the MENA region and African states, for example in green hydrogen projects. Furthermore, restructuring of the economies and private sector involvement are crucial in the MENA region and cannot be circumvented if we are to adapt to and mitigate climate change. Incentives, subsidies and regulations can be successful policy tools to move the region towards the future.

Hearing youth present their visions for the future is a powerful addition to the Fridays for Future movement. For too long, these voices have been neglected and, by giving an in-depth analysis of the situation, they have show their expertise and desire to participate by providing this in-depth analysis. We at FES hope that these voices will be heard and will continue to empower young people to be part of the local, regional, and international debates on the future of climate and energy.

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About FES Regional Climate & Energy Project MENA

The Regional Climate and Energy Project MENA advocates for an energy transition into renewable energy and energy efficiency. It continues to search for solutions for a just transition in the energy sector ensuring both, the protection of the planet and the people.

As the MENA region is one of the most affected areas by climate change, we contribute to policy advising, research, and advocacy in the areas of climate change policy, energy transition, and urban sustainability, with the support of research institutions, civil society organizations, and other partners in the region and in Europe.

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