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MIDDLE EAST-NORTH AFRICA (MENA) REGION

CLIMATE CHANGE NARRATIVE

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MIDDLE EAST-NORTH AFRICA (MENA) REGION
CLIMATE CHANGE NARRATIVE

I- INTRODUCTION

The Middle East and North Africa (MENA) is one of the world's most rapidly transforming regions, whether politically (e.g., the Arab Spring), economically, demographically, or environmentally (McKee et al., 2017). It is one of the most diverse regions in economic terms, with per capita annual gross domestic products (GDP) ranging from just above US$ 500 in Syria and US$ 700 in Yemen to more than US$ 20,000 in the Arab Gulf States by 2021(World Bank Group, 2023). Demographically, it is projected that the region's population will increase from 341 million in 2015 to 571 million in 2050, 685 million in 2070 and 845 million in 2100 in the United Nation's medium-fertility scenario. This demographic growth, together with projected climate change impacts is already affecting the region's resources, especially water and land (Waha et al., 2017). The environmental challenges facing the MENA region will be further developed in SECTION I. SECTION II will focus on the region's climate change trends. In SECTION III, the emphasis will be on the socio-economic impacts of climate change in the region. The response of MENA countries to climate change will be elaborated in SECTION IV. Finally, SECTION V will shed light on the important role the IFRC is playing in dealing with climate change in the MENA region through the large network of National Societies.

II- ENVIRONMENTAL CHALLENGES FACING THE MENA REGION

The MENA region is known for its heterogeneous characteristics in geography, natural resources, political and social structures, and income levels. However, environmental issues can be considered as a common challenge faced by all MENA countries since history (Abumoghli & Goncalves, 2020). These issues mainly include water scarcity and poor water quality, land degradation and desertification, poor waste management, air pollution, and biodiversity loss (Sakmar et al., 2011). Environmental issues are in fact exacerbating with time due to current development scenarios and form a critical problem that should be addressed especially knowing that MENA is one of the regions that is most vulnerable to the impacts of climate change (Abumoghli & Goncalves, 2020).

a- Water Scarcity

The MENA region has a diversity of climates and landscapes, however most of the countries are facing water scarcity issues, with some of them already undergoing "full-blown crises" (Sakmar et al., 2011). The average annual available water per capita in the Arab countries which was 977 cubic meters in 2001 (a number already below the UN definition of water scarcity) is expected to decrease to 460 cubic meters. Except for Iraq, Lebanon, and Syria, all Arab countries are projected to experience severe water stress by 2025 **(Table 1),** especially with population growth (Yamouri, 2010). The situation is expected to get worse with per capita water availability which is predicted to fall by half by 2050 (Sakmar et al., 2011).

Table 1: Freshwater availability of MENA countries (cubic metres per capita per year) (Sakmar et al., 2011)

Country	Scarcity Level
Kuwait, UAE, Qatar, Jordan, Bahrain, Yemen, Palestine, Saudi Arabia, Oman	Acute scarcity: less than 500
Egypt	Scarcity: 500-1000
Lebanon	Stress: 1000-1700
Iraq, Syria	Abundance: more than 1700

As for non-Arab Iran, the country has lost more than 200 cubic kilometers of its total water storage over the last two decades, and groundwater levels have dropped by around 28 centimeters per year on average (Adebahr & Lazard, 2022). This in not only caused by water resource mismanagement, but also due to severe droughts, one of the most recent droughts starting in July 2021 (Lo, 2021).

Water demand in all sectors of the economy (agricultural, industrial, and domestic) is increasing along with population growth in the MENA region that is growing by 2% per year. In fact, groundwater resources began to be over-exploited to meet agricultural needs starting the 1970s when motorized pumps were introduced, noting that agriculture takes up to 80% of water use in the region compared to 70% internationally. Industrial use of water is also high as manufacturing and cooling processes as well removing wastes generated from these processes all require water. On the other hand, domestic use accounts for a small portion of water use in most of the MENA countries, expect for countries that have little agriculture or industry (Roudi-Fahimi, 2002). One of the key issues in the water sector is unsustainable and inefficient use, where 7 countries in the MENA region are using more water than their renewable supplies.

The Gulf countries for instance have the highest per capita consumption of domestic water in the world (50% more per person than in the United States). Leakages in urban systems are often 40-50%, and more than half of water withdrawn for agriculture does not reach the plants as intended (Yamouri, 2010).

Water scarcity in MENA is making this region have the world's highest level of forced displacement. These vulnerabilities are prone to have main implications for the marginalized, impoverished, and least resilient members of society, particularly women and young girls (Aamer, 2021). For example, forced displacements caused by water stress happened in southern Iraq in summer 2019, specifically in Basra, Missan, and Thi-Qar governorates. Southern Iraq is in fact prone to water scarcity and pollution which have increased significantly since 2007, with spikes in 2015 and 2016. Irrigation canals have begun to run dry and water quality has dropped, leading increasing numbers of farmers to stop working their land and move away in search of alternative sources of income. Livestock owners sold their animals to afford to leave. Water shortages were estimated to have displaced almost 15,000 people in Thi-Qar, Missan and Basra as of January 2019, the three governorates accounting for 60, 27 and eight per cent of the total respectively. Most people moved from one rural area to another where there is better access to water (IDMC, 2020). On the other hand, 90% of children in MENA live in areas of high-water stress with serious consequences on their health, nutrition, and development (UNICEF, 2021). To address the water issue, MENA countries are therefore turning to other options to increase supply such as desalination, treatment, and reuse of wastewater while continuing to use older methods such as rainwater harvesting (Roudi-Fahimi, 2002).

b- Land Degradation

Most of the land in MENA is degraded, and the rest is highly vulnerable to further degradation. Studies on land degradation in MENA over the past two decades reveal overall land degradation of 40-70%. Arable lands form roughly 14.5% of the total area, and 27% of these arable lands have degraded between 1999 and 2012. Analysis shows a significant increase in land degradation in northern African countries, especially along the coastline extending from Morocco to Egypt, and the upper Arabian Peninsula containing

Syria and Iraq (World Bank, 2019). Soil erosion, salinization of agricultural land, dust storms, and active sand dunes have significantly increased in the region, in turn giving rise to increased desertification, which is a common type of degradation. About 6% of the region's land area is slightly desertified, 21% is moderately desertified, 31% is severely desertified, and 11% is very severely desertified (World Bank, 2019).

Many interconnected factors contribute to desertification including population growth and demands for greater levels of production that increase resource exploitation, as well as poor land management. The latter are anthropogenic drivers of desertification (World Bank, 2019). In fact, in the past 25 years, the increased cultivation of marginal lands and poor management of rangelands have contributed to the loss of 2 million hectares of agricultural land in North Africa, mainly through soil erosion. Overexploitation has also caused high to extreme levels of soil erosion in about 35% of the Middle East area. Over 130 million hectares of rangeland have degenerated with the high-risk areas including the mountains in Lebanon and Yemen, coastal plains susceptible to seawater intrusion such as in Gaza or the Nile Delta, desert encroachment in the Arabian Peninsula, and salinization in the Jordan Valley (ESCWA, 2016). Alternatively, another direct driver of land degradation is climate change. In fact, sea level rise is quickly becoming a major concern in the Arab region. Many coastal areas are at great risk, if not already affected by salt-water intrusion leading to soil salinization, degradation of coastal lands and aquifers, and loss of biodiversity (ESCWA, 2016). A high concern is for countries facing the Mediterranean Sea which rose at an estimate of about 3 cm/decade over the last two decades (MedECC, 2023).

c- Biodiversity Loss

The Mediterranean basin is recognised as a biodiversity hotspot, where the diversity of its flora is remarkable with 15000 to 25000 species, 60% of which are unique to the region. In addition, about one□third of the Mediterranean fauna is endemic (Vlachogianni et al., 2012). According to 2015 IUCN Red List, approximately 2476 species in MENA are under threat (28% of threatened species comprise fish, 18% plants, 12% birds, 9% mammals). IUCN data shows highest threatened species in Turkey (379), Yemen (292), and Morocco (193) (Nazimudheen, 2022).

Drivers of biodiversity loss in the MENA region could be anthropogenic and include overpopulation, urbanization, littoralisation, unsustainable modes of consumption, as well as marine, freshwater and terrestrial habitat fragmentation and destruction caused by overexploitation of natural resources (Vlachogianni et al., 2012). Climate change is another driver of biodiversity loss. In fact, climate change models indicate that the region will experience decreasing rainfall, increasing land and sea temperatures, as well as progressive desertification and coastal erosion which will have an impact on both the distribution and survival of species (Vlachogianni et al., 2012).

d- Air Pollution and Waste Management

Environmental pollution will cost some nations in the MENA region including Egypt, Lebanon, and Yemen more than 3% of their GDP. Air pollution in MENA for instance comes with an annual $141 billion bill (The Arab Weekly, 2022). MENA's seas have also become more polluted, and the average resident contributes more than 6 kg of plastic waste into the region's seas each year which is considered as the highest level globally. The Maghreb and Mashreq regions mismanage around 60% of their waste while open dumping is prevalent even in higher-income Gulf countries. Total waste generation is expected to almost double by 2050 to 255 million tons (from 129 million tons in 2016), further exacerbating the issue (World Bank Group, 2022).

Focusing on air pollution specifically, cities are responsible for up to 72% of global greenhouse gas (GHG) emissions thus highly contributing to climate change. The cities of the Middle East in particular struggle with a unique set of issues coming from their initial urban design, their geography, the structure of their domestic economies, and the limited or non-existent environmental regulations (Covatariu, 2022). The most health-harmful pollutants are fine PM2.5 particles that penetrate deep into the passageways of the lung and are generated by a variety of sources, including internal combustion engine emissions as well as coal and natural gas burning for electricity and heating purposes in utility-scale facilities or individual units (Covatariu, 2022).

III- CLIMATE CHANGE TRENDS IN THE MENA REGION

a- Temperature Rise and Heatwaves

Warming of about 0.2 degrees per decade has been observed in the MENA region from 1961 to 1990. Robust increase in the number of extremely high temperatures and in the warm spell duration index[1] since the 1960s was also observed. These numbers have risen since then and are projected to increase with time. A regional summer warming well above global mean temperature increase is projected for most of the region except southern parts (Oman, Yemen) (Waha et al., 2017). Maximum temperature is expected to rise throughout the entire

1 An index that depicts periods characterised by several days of very warm temperatures compared to local or regional averages.

MENA region for the 21st century under the RCP 4.5 and 8.5 scenarios[2] . The increase of maximum temperatures is expected to range between 4˚C and 7˚C depending on the area, with most affected cities being in the Arabian Peninsula (Varela et al., 2020).

Because of temperature increase, more heatwave days are also expected. Focusing on the second half of the 21st century under the RCP8.5 scenario, 80% of the capitals from the MENA region will undergo more than 50% of days under heatwave conditions, with cities such as Riyadh (Saudi Arabia) that will practically be under heatwave conditions during the entire warm season. The intensity of heat waves is also expected to increase for almost the whole MENA region. Focusing on the second half of the 21st century under the RCP8.5, mean heatwaves intensity will grow between 2˚C and 4˚C (Varela et al., 2020). For a business-as-usual pathway, the second half of this century will undergo unprecedented extreme heatwaves which involve excessive high temperatures (up to 56 °C and higher) for extended durations, being potentially life-threatening for humans. By the end of the century, about half of the MENA population (approximately 600 million) could be exposed to annually recurring extreme heatwaves where more than 90% will live in urban centres (Zittis et al., 2021).

b- Precipitation Patterns and Droughts

Rainfall in the MENA region is projected to decrease, especially in countries along the Mediterranean shore like Morocco, Algeria, and Egypt, which are projected to receive significantly less rain. However, projected annual mean precipitation changes will show a clear north–south dipole pattern, with regions to the north becoming comparatively drier and regions to the south becoming wetter. The absolute increase in precipitation in the southern regions, however, will be very small, given this region's hyper-arid climate. It is essential to note that this precipitation increase may be associated with more intense and extreme precipitation events (Waha et al., 2017).

On the other hand, an increase in meteorological drought has been reported since the 1960s which is consistent with the overall regional drying trend. In fact, there is a close relationship between the pattern of change in the annual mean aridity index (AI) and projected precipitation changes since changes in aridity are mostly driven by changes in precipitation. **Figure 1** shows that wetter conditions south of 25□N will cause a drop in aridity, and that drier conditions north of 25□N will cause aridity in this area to increase. MENA countries are consistently projected to become global hot spots for drought by the end of the

2 RCP 4.5 is described by the Intergovernmental Panel on Climate Change (IPCC) as a moderate scenario in which emissions peak around 2040 and then decline. RCP 8.5 is the highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century.

twenty-first century, even under the strictest mitigation scenario (RCP 2.6[3]). For scenario RCP 8.5, an increase of more than 50% in the number of drought days around the Mediterranean by the end of the 21st century is projected.

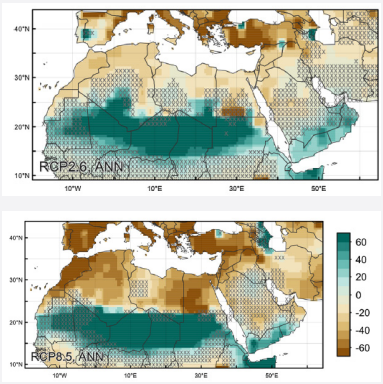

Figure 1: The percentage change in the aridity index for scenarios RCP2.6 (Top) and RCP8.5 (Bottom) by 2071–2099 relative to 1951–1980. Hashed areas indicate uncertain results, with models disagreeing on the direction of change (Waha et al., 2017).

c- Sea-Level Rise

Sea-level rise (SLR) projections for the MENA region form an important challenge due to the semi-enclosed nature of both the Mediterranean and the Red Sea basins which are connected to the broader Atlantic and Indian Oceans respectively (Waha et al., 2017). Coastal areas in the MENA region where elevation is less than 5m above sea level comprise about 7% of the total population as well as a big portion of economic and agricultural activities in addition to major urban centres. These areas are exposed to increasing risks of flooding, inundation, land erosion and salinization due to SLR which could also affect 43 port cities including Alexandria (Borghesi & Ticci, 2019). In fact, about 0.25% of MENA's land area would be impacted by a 1-m SLR, a number considered small compared to other world regions, however, the impact is much more severe in terms of urban and agricultural areas affected, as well as population affected, and GDP lost. A 1-m SLR will negatively impact 3.2% of MENA's population (compared to 1.3% worldwide), 1.49% of its GDP (compared to 1.30% worldwide), 1.94% of its urban area (compared to 1.02% worldwide) and 1.15% of its agricultural area (Dasgupta et al., 2009).

IV- SOCIO-ECONOMIC IMPACTS OF CLIMATE CHANGE IN THE MENA REGION

a- Agriculture, Water and Food Security

Countries in the MENA region heavily rely on agriculture as a source of food, whether in the historically important "fertile crescent" of the Euphrates and Tigris region or in the Mediterranean region and the Nile. 70% of the region's agriculture production is rainfed, knowing that most of the lands in MENA receive less than 300 mm of annual rainfall (200-300 mm roughly represents the lower limit of rainfed agriculture) (Waha et al., 2017). The MENA region is therefore highly vulnerable to temperature and precipitation changes with related consequences on food security. **Figure 2** shows that there is a strong correlation between

3 According to the IPCC, RCP 2.6 requires that carbon dioxide (CO_2) emissions start declining by 2020 and go to zero by 2100.

crop yield decrease and temperature increase. In fact, crop yields are expected to decline by 30% with a 1.5-2 degrees C warming, and up to 60% with 3-4 degrees C warming.

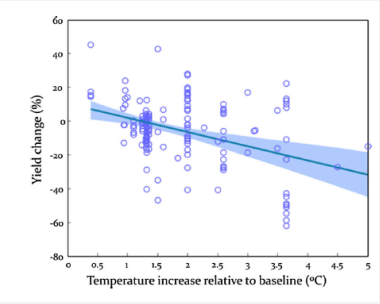

Figure 2: Crop yield changes with temperature increase in the MENA region (Waha et al., 2017)

On the other hand, irrigated agriculture in some MENA countries consumes up to 85% of water resources (Al-Otaibi, 2015), which are already scarce. In addition, research on the MENA region by the World Food Programme (WFP) and Overseas Development Institute (ODI) states that people's food security will also be affected by a reduced renewable freshwater availability by 2030. The impacts of climate change on freshwater security will not only affect the countries that depend on these resources within their territories, but also in external territories where such resources emerge (Tull, 2020). This, along with the growing population that is expected to double by 2070 will increase the dependency on food import, which is already high for many crops, making the whole region vulnerable to global price shocks that arise from crises (Borghesi & Ticci, 2019), one of them being the recent Ukrainian crisis. In fact, the MENA region heavily depends on supplies from Russia and Ukraine, which account for 27% and 53% of the global trade in wheat and sunflower oil and seeds, respectively. Ukraine and Russia are the sources of over 50% of wheat imports in at least 5 MENA countries: Egypt, Lebanon, Libya, Tunisia, and Yemen, a number that rises to over 80% in Egypt. In addition, Syria relies mostly on Russia for its wheat imports, while Jordan imports most of its wheat from Romania and around 10% from Ukraine (Kandeel, 2022).

Focusing on the Middle East more specifically, and while agriculture represents about 13% of the region's GDP, the sector plays a crucial role in promoting resilient food systems and keeping critical economic sectors alive. Out of the region's total population of 296 million people, 84 million, or 28%, are entirely dependent on agriculture. For this reason, the promotion of sustainable agricultural practices that could adapt with the above-mentioned issues is essential (Bernadaux, 2021).

b- Climate-Sensitive Health Risks

According to the Intergovernmental Panel on Climate Change (IPCC) and to prevent catastrophic health impacts with millions of climate change-related deaths globally, the world must limit temperature rise to 1.5°C, noting that a global heating of even 1.5°C is not considered safe. Health is already being impacted by climate change in various ways through illnesses from increased extreme weather events such as heatwaves, storms, and floods, which could eventually lead to mental health issues or even death. Such health risks are disproportionately felt by the most vulnerable and disadvantaged, including women, children, ethnic

minorities, poor communities, migrants or displaced persons, older populations, and those with underlying health conditions (WHO, 2021). These illnesses are either heat-related, respiratory, water-borne, vector-borne, food-borne, or zoonotic **(Figure 3).**

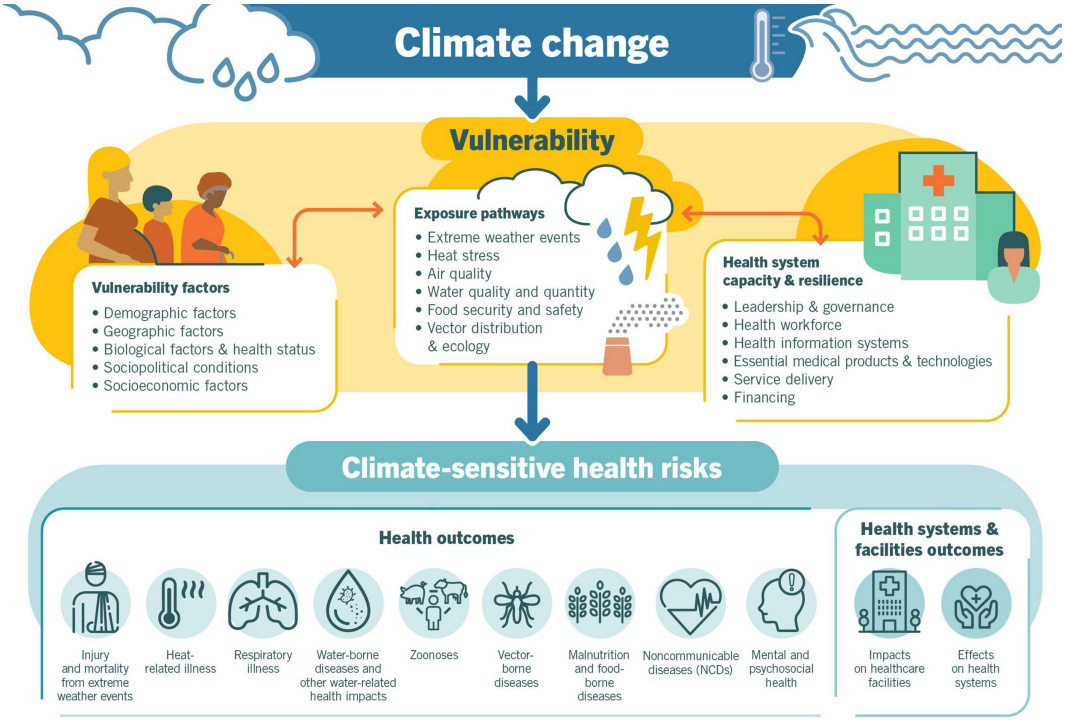

Figure 3: An overview of climate-sensitive health risks (WHO, 2021)

Focusing on the MENA, populations face a variety of health risks, many of which are exacerbated by the hot and arid conditions and the relative water scarcity characterizing the region. These conditions which are intensified by climate change will cause the spread of illnesses and diseases including water-related diseases such as cholera, which is associated with high temperatures and water contamination, as well as trachoma, which is associated with dry conditions and poor sanitation (Waha et al., 2017). Vector-borne diseases such as malaria, elephantiasis (a disease of the lymphatic system caused by parasitic worms transmitted by mosquitoes), and leishmaniasis (a skin disease carried by sandflies endemic to the MENA region) will also proliferate. In addition, dengue fever outbreaks have been reported to be more frequent since 1998 particularly in Saudi Arabia and Yemen, and recent modelling suggests that some areas that are currently climatically unfavourable to the dengue vector *Aedes aegypti*, including the Arabian Peninsula and southern Iran, may become more favourable with climate change (Waha et al., 2017). Extreme weather events such as heat waves, flooding, droughts, and landslides will result in increased morbidity and mortality, while high temperatures will cause several medical conditions including heat stress, heat exhaustion, and heat stroke, with the elderly,

the young, and people with existing medical conditions being the most vulnerable. For instance, workers in the construction industry in the MENA region are already undergoing tough conditions and suffer from heat exhaustion and dehydration, and measures to limit working hours during peak heat periods, such as those implemented by Qatar, may hence become increasingly necessary with implications on productivity. Thermal discomfort is also expected to increase, particularly in the southern parts of the Arabian Peninsula, challenging people's health especially in densely populated large cities that already experience high maximum temperatures. Poor urban households will experience high heat stress since they cannot afford cooling and cannot access electricity, such as in the Republic of Yemen for example where only about 40% of the population has access to electricity. On the other hand, the MENA region already carries a considerable health burden caused by air pollution which is projected to increase with rising temperatures. Air pollution can cause or exacerbate respiratory illnesses such as asthma (Waha et al., 2017).

c- Energy Sector

Energy demand which includes daily life processes such as peak hour patterns, air conditioning intensity, and need for water desalination is already being influenced by climate change due to the increased extreme temperature variations and precipitation decrease in most MENA countries. In fact, countries are being forced to mostly rely on energy-intensive methods for providing water like desalination and underground water pumping. In addition, agricultural practices are affected by temperature and precipitation changes as farmers become more dependent on energy-intensive irrigation methods to maintain productivity levels. The latter is also being influenced by the decrease in the ability of laborers to healthily work in open-air conditions. Hours of operation for some businesses are therefore changing, which may lead to growing overall energy consumption especially if the hotter weather drives increased demand for air conditioning (Klawitter et al., 2012).

On another note, in Lebanon, Iraq, Yemen, Syria, and Gaza, governments can't maintain a functioning central power network whether because of conflict or mismanagement. For this reason, there is a big dependence on private generators. For instance, the Gaza Strip's 2.3 million people rely on around 700 neighborhood generators across the territory. In addition, reliance has increased since Lebanon's economy collapsed in late 2019 and central power cut-offs began lasting longer. Researchers found that the level of toxic emissions may have quadrupled since Lebanon's financial crisis began because of increased reliance on generators. In Iraq's northern city of Mosul, thousands of private generators are operational to compensate electricity cuts, where each produce 600 kilograms of carbon dioxide and other greenhouse gases per 8 hours working time. In fact, air pollution from diesel generators

contains more than 40 toxic air contaminants, including many known or suspected cancer-causing substances. Greater exposure to these pollutants increases respiratory illnesses and cardiovascular diseases. Since they usually use diesel, generators also produce more climate change-inducing emissions than a natural gas power plant does. As opposed to power plants outside urban areas, generators are in the heart of neighborhoods, pumping toxins directly to residents (Karam, 2022).

d- Population Displacements

In the context of climate change, displacement happens when the physical, economic, social, or political security of a population decreases and no other resources can be mobilized to adapt to the new conditions (Waha et al., 2017). Many areas in the MENA region are prone to high risks of climate change and hence displacement. This is due to water insecurity, drought, and unequal social distribution of resources (UNHCR, 2021), as well as sea-level rise (Waha et al., 2017). These climate-related problems will threaten to displace millions of people in the region: in fact, disasters forced nearly 3 million people to leave their homes in Africa and the Middle East in 2021, and by 2050 it is predicted that 19.3 million people will be internally displaced by climate change in North Africa (Alsaar, 2022). However, the poorest often cannot afford the costs for the displacement journey or migrate through life-threatening channels. The newcomers are often stigmatized and have worse access to local networks and education (Waha et al., 2017). It is important to mention that most migration within the MENA region is internal, with 'urbanization' being the predominant pattern since rural livelihoods are directly affected by climate change. If current migration patterns continue, most migrants are likely to initially be men migrating without their families. Women left behind in rural areas may thus face more intensive workloads in agriculture, domestic work, and the management of scarce water supplies. If rural women taking on new roles do not have the skills to generate productive livelihoods, because of discriminatory social norms and limited education opportunities, then they are at risk of falling into poverty (Waha et al., 2017).

In Kuwait and Saudi Arabia, heavy seasonal rainfall is already causing fatalities and temporary displacement (UNHCR, 2021). In Egypt, agriculture is becoming less profitable due to the appearance of new parasites, which is leading to an exodus from the countryside towards cities or other countries especially within the youth. In addition, the agriculture sector in the country could shrink by 47% by 2060 due to sea-level rise, and in the Egyptian city of Alexandria, for example, 2 million people (nearly a third of its inhabitants) could be displaced and 214,000 jobs lost if the sea level rises by half a meter. On the other hand, around 7% of North Africa's population live less than 5m above sea level, and as coastlines are affected, people will naturally migrate to other big cities located away from the coast (Alsaar, 2022).

V- RESPONSE TO CLIMATE CHANGE IN THE MENA REGION

a- The Beginning of a "Green Transition"

To maintain climate change at +1.5°C by the end of the century, climate mitigation processes should be accelerated. To do so, total emissions must peak in 2025, then decrease by 43% by 2030, then turn net-zero after 2050 (Intergovernmental Panel on Climate Change (IPCC), 2022). The MENA region has a low contribution to the world's emission, however, the region records some of the highest greenhouse gas (GHG) emissions per capita caused by human activities that are some of the most carbon intensive. In fact, the MENA region represented 5% of global GHG emissions in 2019, a relatively small number when compared to other regions such as Eastern Asia which produced 27% of the world's emissions. Nevertheless, 13 tons of CO2 are emitted per capita per year (above Europe with 7.8 tons) with the Gulf States ranked as the biggest emitters per capita, and more specifically Qatar being the country with the highest GHG emissions per person in the world (Lienard, 2022).

The world is now shifting away from fossil-based energies and redirecting to renewable energies. In fact, fossil fuel trade between the regions would diminish by 40% by 2050. Primary energy coming from renewables is however still very low in the MENA region, as it accounted for only 0.25% in Algeria in 2020 and 0.09% in Saudi Arabia, way below the 5.56% in Egypt and 8.21% in Morocco (Lienard, 2022). It is therefore essential to mention that this region has a large potential to invest in the production of green energy. In fact, sunshine rate in the MENA region is one of the highest on the planet as it receives between 22% and 26% of all solar energy striking the earth, which translates to a potential for solar energy per square kilometres per year equivalent to the energy generated from 1 to 2 million barrels of oil. According to a study by Apostoleris et al. (2021), the solar business is getting more profitable in the Gulf States and could be a more affordable source of energy than fossil fuels in the future. In addition, Morocco, Jordan, and Saudi Arabia have a high potential for generating wind-based energy. Egypt has set to achieve 42% of its electricity through a mix of renewables by 2035, a project that is assessed to be achievable and even underestimated as Egypt possesses the ability to produce electricity from a 53% share from renewables by 2030. On the other hand, the MENA region's biggest wind farm was built in Saudi Arabia, in Dumat Al-Jandal, and has operated to provide sustainable energy to 70 000 households since August 2021. Other renewable projects are ongoing, mainly with the construction of solar farms in Dubai (the Mohammed bin Rashid Solar Park), in Morocco

(the Ouarzazate Solar Power Station), and in Egypt (in Aswan with the building of 41 solar plants) (Lienard, 2022).

Sustainable Agriculture Initiatives in the MENA region:

Sustainable agriculture is promoted on two different scales across the region. The countries of the Gulf Cooperation Council (GCC) are at the front of the large-scale "agritech" movement through collaborations between start-ups, private businesses, and governments with the UAE being the country with the most significant investment in this field to date. In fact, the Abu Dhabi Investment Office (ADIO) invested more than $100 million in "agritech" companies in the context of its National Food Security Strategy. An example of a successful project designed to address the fact that the UAE imports more than 80% of its food requirements is Badia Farms, which emerged as the Gulf's first indoor vertical farm. This soilless farming method for agricultural growth is estimated to use 90% less water than open fields. In addition, responding to increased patterns of desertification in the UAE, the company Desert Control is resorting to a new non-intrusive soil recovery technology based on Liquid Natural Clay (LNC), a nano-clay that turns unproductive desert land into fertile soil. Given the rapid development of diverse methods and technologies, knowledge sharing between "agritech" start-ups has become crucial in supporting sustainable agriculture in the region which prompted the creation of platforms such as AgraME which organizes meetings and exhibitions to bring together the agriculture community in the region (Bernadaux, 2021). On the other hand, in contrast to the above-mentioned large-scale investments, the region has also witnessed the rise of small-scale agricultural techniques carried out by private actors and grassroots networks in lower-income countries. In Egypt, the start-up Wastilizer uses animal waste to produce plant fertilizers, intending to enhance the quality of crops based on the concept of a circular economy. Meanwhile, the Lebanese start-up Riego has developed an irrigation system using hardware and software to reduce agricultural water consumption (Bernadaux, 2021).

Investing in renewable energies has many benefits for the MENA region such as meeting electricity demands and providing jobs. In fact, and while electricity consumption increased by 190% in the region between 1999 and 2019, fragile countries like Lebanon, Syria, Iraq, Libya, and Yemen are failing to meet their electricity demands. On the other side, Egypt managed to fill its electricity shortage by generating 25% of surplus with new solar and wind energy mixes. In terms of jobs, shifting to renewable energies could create 207 000 jobs in the Gulf countries by 2030. In Saudi Arabia, Iran, Iraq, Kuwait, Qatar and the UAE, the number of jobs in renewables will increase by 169% between 2017 and 2050, thus creating 2.1 million additional jobs from the energy transition (Lienard, 2022). The Gulf States, Egypt, Jordan, Morocco, and Tunisia are some of the MENA countries that are on their way towards the transition

to sustainable energies for climate change mitigation. However, other countries such as Libya, Algeria, and Iraq are considered oil-dependent fragile countries which might not survive the energy transition if nothing is done to find substitutes. In fact, oil rents in Libya (which is still in the middle of an extended conflict) and Iraq (which is recovering from 30 years of conflict) represented 40% of the domestic GDP in 2019. In addition, 95% of Libyan exports in 2018, 96% of Algeria's exports in 2017, and almost 100% of Iraqi exports were fossil fuels while other states like the Gulf countries have managed to diversify the products they are exporting in the last few years (Lienard, 2022).

b- An Intensified Environmental Activism

Climate change has only recently gained mainstream attention in MENA (Lahn, 2022). In fact, MENA citizens recognize the existence and importance of climate change but rank it lowest in the list of priorities for government spending as well as preference for foreign aid, as other pressing issues take priority such as food insecurity, subsidies, and education (Abufalgha, 2022).

Environmental activism has started to intensify across the region over the past few decades with a particular focus on environmental issues affecting public health, livelihoods, and essential services. Urban activists for instance often focus on issues such as air pollution, traffic, lack of green space and recreational opportunities, inadequate solid waste collection and disposal, and industrial proximity. On the other hand, rural activists focus on the lack of access to land and water resources, inadequate sanitation and solid waste systems, and displacement and threats to livelihoods from large state-led projects such as dams. There are 3 types of environmental activism in the MENA region: the informal small-scale activism, the spread of environmental non-governmental organizations (ENGOs), and the coordinated popular resistance campaigns that typically include media outreach and lobbying (Sowers, 2018). The October 2019 uprisings in Iraq and Lebanon for instance were aggravated by environmental and public safety failings such as poor drinking water provision in Iraq, an inadequate response to forest fires in Lebanon, and insufficient power in both countries. The province of Basra in Iraq underwent violent clashes with the government after mass water poisonings in 2018. In Khuzestan, southwestern Iran, public anger caused by the collapse of a building killing over 40 people (blamed on the illegal addition of three storeys) sparked and was combined by long-term water shortages, rising food prices, and harsh dust storms in May 2022 (Lahn, 2022).

On another note, the MENA region is one of the smallest recipients of climate finance in the world, with conflict-affected nations like Yemen, Iraq and Syria receiving some of the lowest amounts of funding. COP27 (Egypt) and COP28 (UAE) will therefore give MENA countries a chance

to pressure the Global North to end this neglect and to advocate for increases in loss and damage funding. COP27 and COP28 will form opportunities to build unity and drive forward an agenda that puts the region's interests in the forefront to demand climate justice and equitable financing (Hadid, 2022).

c- The Development of National and International Policies and Plans to Tackle Climate Change

All MENA countries have raised their ambitions to decrease emissions ahead of COP26 in November 2021, with Lebanon, the UAE, and Yemen pledging to decarbonize by 2050, while Saudi Arabia and Bahrain set their commitments to 2060. Jordan, Morocco, Palestine, Tunisia, and Qatar also submitted more ambitious climate goals through their Nationally Determined Contributions (NDC) (Lienard, 2022)*.

* More detailed data regarding each MENA country can be found in the climate factsheets.

VI- THE ROLE OF IFRC IN RESPONSE TO CLIMATE CHANGE

Note: this section will tackle the 17 countries covered by IFRC in the MENA region, namely: Morocco, Algeria, Tunisia, Libya, Egypt, Palestine, Lebanon, Syria, Jordan, Iraq, Iran, KSA, UAE, Qatar, Bahrain, Kuwait, Yemen

Climate crises are at the top of the list of five global challenges that must be addressed according to IFRC's Strategy 2030, which is the network's collective plan of action to tackle the major humanitarian and development challenges of this decade. In Strategy 2030, IFRC aims to integrate climate risk management across all programmes, focus on the drivers of vulnerability, build a strong collective voice on climate, and reduce IFRC's own climate and environmental footprint. Concretely, through IFRC's "Plan and Budget 2021-2025", the federation aims to ensure that:

- 250 million people are better protected from heat (the most ignored and rapidly rising climate risk) by 2025, in at least 150 cities and towns.
- 50 coastal cities are supported to adapt to longer-term impacts of climate change, including sea level rise, by 2025.
- 100 National Societies harness the power of nature through nature-based solutions focused on reducing disaster risks and adapting to and mitigating climate change, with a particular focus on planting of trees and mangroves.

- 100 National Societies implement environmental, or climate campaigns focused on behaviour change, plastic reduction, or clean-ups.

a- IFRC's Contributions to COP 27 in Egypt

The COP 27 climate summit was held in Sharm el-Sheikh, Egypt, from November 6th, 2022 to November 18th, 2022, with a focus on enhancing implementation. It concluded to help vulnerable countries deal with losses and damages from the impacts of climate change, however, the discussions also disappointed many stakeholders by not taking any significant new steps to curb emissions (Alayza et al., 2022). From its side, the IFRC is committed to support the most vulnerable countries and communities in responding to the climate crisis. For this reason, 5 key messages were mainly addressed by IFRC in COP 27 after stressing that the climate crisis is already a humanitarian crisis (IFRC, 2022):

1. **INCREASE THE URGENCY AND ACTION TO ADDRESS THE HUMANITARIAN IMPACTS OF THE CLIMATE CRISIS:** Reduce greenhouse gas emissions to prevent even worse humanitarian impacts, whilst also vastly scaling up adaptation action.

2. **PRIORITIZE THE NEEDS OF THE MOST VULNERABLE IN CLIMATE ACTION:** Recognize the humanitarian impacts of the climate crisis, prioritize support for the most vulnerable people and communities, focus on protection and inclusion of all in laws, policies, and plans.

3. **INCREASE THE AMOUNT AND ACCESSIBILITY OF CLIMATE FINANCE:** Increase attention and finance for adaptation and resilience as well as Loss and Damage, prioritize funding for the most vulnerable countries and communities, including fragile and conflict-affected countries and communities, make climate finance more accessible, including for local actors.

4. **SCALE UP EFFECTIVE CLIMATE ACTION:** Strengthen domestic climate and disaster regulatory frameworks, increase investment in multi-hazard integrated risk management, make action more anticipatory and innovative, develop heatwave action plans and use of nature-based-solutions (NBS) for disaster risk reduction (DRR).

5. **IMPLEMENT LOCALLY-LED ACTION:** Engage in and enable meaningful engagement and participation, co-implementation of solutions with communities, adopt and implement principles for locally led adaptation, decentralize access to climate finance.

b- IFRC Climate-Related Disaster Response in the MENA Region

IFRC GO is a platform that aims at making all disaster information universally accessible and useful to IFRC responders for better decision making.

After the analysis of the all the "operations data" available on the platform regarding MENA countries, it can be concluded that "floods" are the main climate-related disaster in the region where IFRC had a direct response for (from 1954 until 2022). More details regarding other climate-related disasters can be seen in **figure 4:**

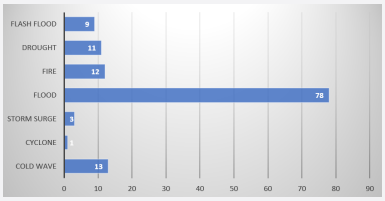

Figure 4: Frequency of climate-related disasters where IFRC had a direct response

On the other hand, it can be noticed that the type of funding used in response to the above climate-related disasters started shifting from "appeals" to "DREFs". In fact, when IFRC climate-related operations in the MENA region began in 1954, the main funding type was "appeals". However, starting the late 1990s, the number of "appeals" began to decrease with a bigger focus on "DREFs", as seen in **figure 5:**

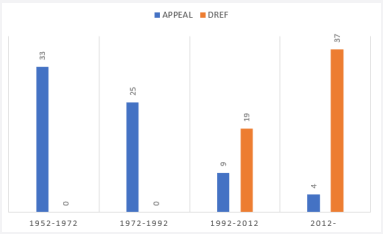

Figure 5: The evolution of the type of available funding for climate-related operations over the years *

* Details regarding each MENA country (year, type of climate-related disasters, type of funding, amount of funding) can be seen in the APPENDIX.

c- IFRC's Global Climate Resilience Platform

The Global Climate Resilience Platform is a fundraising initiative to improve and expand the community-based climate action work of Red Cross and Red Crescent Societies around the world. The funding will be channeled into locally led climate action and adaptation efforts that aim at increasing community resilience to the impacts of climate change and climate-related disasters. The Platform also seeks at exploring innovative financing options to unlock access to non-traditional funding, expertise, and partnerships.

The Platform supports work in 100 countries around the world that are most vulnerable to climate change. The countries targeted from the MENA region are Algeria, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Palestine, Syria, and Yemen.

The Platform has four targets for 2027:

1. Increasing resilience: the IFRC network will support at least 500 million people to increase their resilience to the impacts of climate change and improve their adaptive capacities in the most climate vulnerable countries.

2. Supporting national societies: the IFRC network will support at least 100 National Red Cross and Red Crescent Societies in developing and implementing climate resilient strategies and plans.

3. Meaningful participation: the IFRC network will support meaningful participation and active leadership of women, local communities, Indigenous Peoples, youth and other marginalized and/or underrepresented groups in the development and implementation of locally led climate resilience programs in 100 countries.

4. Climate finance: the IFRC network aims at raising at least CHF 1 billion in financing to support a five-year global program to scale up local and community-based climate action.

The Platform has three focus areas:

1. Early warning and anticipatory action: early action, also known as anticipatory action or forecast-based action, means taking steps to protect people before a disaster strikes, based on early warning or forecasts. The types of actions vary depending on the hazard and context. They can include everything from planned evacuations and reinforcing homes, to distributing health protection kits and setting up mobile cooling centers.

2. Safety nets and shock-responsive social protection: social protection systems can be an effective and sustainable way of reducing the impacts of climate risks on vulnerable households. They can support larger amounts of people than humanitarian interventions alone and can help people build their resilience beyond short-term coping strategies. When designed well, they can also effectively anticipate, respond, and adapt to climate shocks and stresses.

3. Nature-based solutions: nature-based solutions are actions that protect, sustainably manage, or restore an ecosystem to address societal challenges—such as disaster risk, climate change, food security, water security or human health.

IFRC network teams have been implementing nature-based solutions for many years, such as:

- Restoring mangroves along coastlines to act as a natural protective barrier against storm surges.
- Helping communities engage in sustainable agriculture and water conservation.
- Setting up soil and landscape restoration projects to regulate the flow of rainwater, in turn preventing flooding and helping increase crop yields.

d- IFRC's Climate-Smart Disaster Risk Reduction

Climate-smart disaster risk reduction saves lives by limiting the amount of risk people face and the level of damage a crisis might cause. It can help communities effectively prepare for and cope with natural hazards. This approach is vital because the number of disasters is increasing every year.

Climate-smart disaster risk reduction programming resources includes several guidance and tools:

1. The Nature Navigator: The Nature Navigator is a handbook for people working in disaster risk management on how to work with nature to protect communities.

2. Climate Risk and Early Warning Systems (CREWS) guidance: this guidance provides advice and recommendations for how National Societies can get involved in CREWS projects which aim to increase the access of Least Developed Countries (LDCs) and Small Island Developing States (SIDS) to early weather warnings and risk information to save lives and livelihoods.

3. Community risk assessment and resilience planning guidance: step-by-step guidance on how to operationalize the IFRC's Framework for Community Resilience using the Enhanced Vulnerability and Capacity Assessment (EVCA) approach.

4. Climate-smart programming guide

5. Forecast-based financing manual: teaches how to use innovative technologies, data and weather forecasts to protect lives and livelihoods before a disaster strikes.

6. Community Early Warning Systems: guiding principles: this guide offers an overview of how to set up or strengthen existing community early warning systems that can reduce people's risk and save lives.

7. Public Awareness and Public Education (PAPE) messages: help communities improve their knowledge of disaster risks and put in place measures to stay safe.

8. City Heatwave Guide: practical actions that National Societies can take to best support their communities in towns and cities during a heatwave.

9. Community Resilience Measurement Dashboard: provides multiple tools to help National Societies, IFRC staff and partners measure the resilience of communities they're supporting.

VII- CONCLUSION

Although the MENA region has heterogeneous characteristics in geography, natural resources, political and social structures, and income levels, a common aspect is that MENA will be severely affected by climate change. The region is in fact already facing many environmental challenges such as water scarcity, land degradation, biodiversity loss, and air pollution. These will be exacerbated by the impacts of climate change, including temperature rise and heatwaves, a change in precipitation patterns leading to droughts, along with a rise in sea levels which could inundate low-lying coastal areas. The impacts of climate change are accompanied with socio-economic drawbacks especially in the agriculture and water sectors which makes the state of food security in MENA relatively unstable, along with negative consequences on human health. The response to climate change in the region has already started, through the development of national and international policies and plans to tackle the issue. In addition, the beginning of a green transition to clean and renewable energy is observed, as well as sustainable water and agricultural initiatives. Environmental activism has also intensified over the past years implying an increased environmental awareness and concern in MENA populations, especially with COP 27 and COP 28 taking place in the region. On another note, it is essential to shed light on the important role of IFRC in helping communities adapt and mitigate climate change. This is done through its operations in response to climate-related disasters, along with other initiatives such as the Global Climate Resilience Platform, and the climate-smart disaster risk reduction programming resources.

VIII- REFERENCES

Aamer, F. (2021, September 9). *Water crisis in the Mena Region • Stimson Center*. Stimson Center. Retrieved from https://www.stimson.org/2021/water-crisis-in-the-mena-region/

Abufalgha, M. (2022, October). *Views on the Environment and Climate Change in the Middle East and North Africa*. Arab Barometer. Retrieved from https://www.arabbarometer.org/

Abumoghli, I., & Goncalves, A. (2020). *Environmental challenges in the MENA region*. UNEP. Retrieved from https://wedocs.unep.org/bitstream/handle/20.500.11822/31645/EC_MENA.pdf?sequence=1&isAllowed=y

Adebahr, C., & Lazard, O. (2022, July 7). *How the EU can help Iran tackle water scarcity*. Carnegie Europe. Retrieved from https://carnegieeurope.eu/2022/07/07/how-eu-can-help-iran-tackle-water-scarcity-pub-87281

Alayza, N., Bhandari, P., Burns, D., Cogswell, N., Zoysa, K. de, Finch, M., Fransen, T., González, M. L., Krishnan, N., Langer, P., Larsen, G., Srouji, J., Warszawski, N., & Waskow, D. (2022, December 8). *COP27: Key Takeaways and what's next*. World Resources Institute. Retrieved from https://www.wri.org/insights/cop27-key-outcomes-un-climate-talks-sharm-el-sheikh#:~:text=The%20COP27%20climate%20summit%20in,the%20impacts%20of%20climate%20change

Al-Otaibi, G. (2015). *By the numbers: Facts about water crisis in the Arab world*. World Bank Blogs. Retrieved from https://blogs.worldbank.org/arabvoices/numbers-facts-about-water-crisis-arab-world

Alsaar, S. (2022, October 30). *Millions at risk of climate displacement in Middle East*. Al-Monitor. Retrieved from https://www.al-monitor.com/originals/2022/10/millions-risk-climate-displacement-middle-east

Apostoleris, H., Al Ghaferi, A., & Chiesa, M. (2021). What is going on with Middle Eastern solar prices, and what does it mean for the rest of us? *Progress in Photovoltaics: Research and Applications*, *29*(6), 638-648.

Bernadaux, C. (2021, May 19). *Agricultural Technology in the Middle East: Sowing the seeds of the future*. Middle East Institute. Retrieved from https://www.mei.edu/publications/agricultural-technology-middle-east-sowing-seeds-future

Borghesi, S., & Ticci, E. (2019). Climate change in the MENA region: environmental risks, socioeconomic effects and policy challenges for the future. *IEMed Mediterr. Yearb*, *2019*, 289-292.

Covatariu, A. (2022). *Urban pollution across the Middle East and Black Sea regions: Causes and mitigation measures*. Middle East Institute. Retrieved from https://www.mei.edu/publications/urban-pollution-across-middle-east-and-black-sea-regions-causes-and-mitigation

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D., & Yan, J. (2009). The impact of sea level rise on developing countries: a comparative analysis. *Climatic change*, *93*(3), 379-388.

ESCWA. (2016). *Factsheet on land degradation*. Retrieved from https://www.unescwa.org/sites/default/files/event/materials/escwa_factsheet_landdegradationneutrality_arabregion_final_draft_0.pdf

Hadid, S. (2022, November 11). *Why COP27 and COP28 are critical for conflict-hit MENA*. Climate

Crisis | Al Jazeera. Retrieved from https://www.aljazeera.com/opinions/2022/11/11/why-cop27-and-cop28-are-critical-for-the-conflict-hit-mena

IDMC. (2020). *WHEN CANALS RUN DRY: Displacement triggered by water stress in the south of Iraq.* Retrieved from https://www.internal-displacement.org/sites/default/files/publications/documents/202002-iraq-slow-onset-report.pdf

IFRC. (2022). *Increasing The Urgency and Action on The Climate Crisis, Key Messages.*

Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate Change 2022, Mitigation of Climate Change*. Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (AR6).

Kandeel, A. (2022, August 31). *Climate vulnerability and food insecurity in Mena should be priorities for US policymakers*. Atlantic Council. Retrieved from https://www.atlanticcouncil.org/blogs/menasource/climate-vulnerability-and-food-insecurity-in-mena-should-be-priorities-for-us-policymakers/

Karam, Z. (2022). *In parts of Mideast, power generators spew toxic fumes 24/7.* AP News. Retrieved from https://apnews.com/article/middle-east-africa-ap-top-news-lebanon-a8448b0d8b3fb921f8f8fc77b798958d

Klawitter, J., Parthemore, C., Hasbani , K., Valencia, A., Viëtor , M., & Zahran, A. (2012, February 2). *Implications of climate change on energy and security in the MENA region*. Middle East Institute. Retrieved from https://www.mei.edu/publications/implications-climate-change-energy-and-security-mena-region

Lahn, G. (2022, September 22). *'Cascading' climate risks in the Middle East and North Africa*. China Dialogue. Retrieved from https://chinadialogue.net/en/climate/cascading-climate-risks-middle-east-north-africa/

Lienard, C. (2022, March). *Mitigating climate change in the mena: Shifting to a new paradigm: Bic-RHR*. BIC. Retrieved from https://www.bic-rhr.com/research/mitigating-climate-change-mena-shifting-new-paradigm

Lo, J. (2021, July 28). *Drought and water mismanagement spark deadly protests in Iran.* Climate Home News. Retrieved from https://www.climatechangenews.com/2021/07/28/drought-and-water-mismanagement-spark-deadly-protests-in-iran/

McKee, M., Keulertz, M., Habibi, N., Mulligan, M., and Woertz, E. (2017). *Demographic and Economic Material Factors in the MENA Region.* MENARA. Retrieved from https://www.iai.it/sites/default/files/menara_wp_3.pdf

MedECC. (2023). *Climate and environmental change in the Mediterranean – main facts.* Retrieved from https://www.medecc.org/climate-and-environmental-change-in-the-mediterranean-main-facts/

Nazimudheen, G. (2022, August 24). *Things to know about habitat loss in MENA*. EcoMENA. Retrieved from https://www.ecomena.org/habitat-loss-in-mena/

Roudi-Fahimi, F., Creel, L., & De Souza, R. M. (2002). *Finding the balance: Population and water scarcity in the Middle East and North Africa* (pp. 1-8). Washington, DC: Population Reference Bureau. Retrieved from https://www.prb.org/wp-content/uploads/2021/01/FindingTheBalance_Eng.pdf

Sakmar, S. L., Wackernagel, M., Galli, A., & Moore, D. (2011, June). *Sustainable development and Environmental Challenges in the MENA Region: Accounting for the Environment in the 21st century.* Economic Research Forum. Retrieved from https://www.unescwa.org/sites/default/files/event/materials/accounting_for_the_environment_erf_sakmar_et_al_2011.pdf

Sowers, J. (2018, October 31). *Environmental activism in the Middle East: Prospects and challenges*. Franklin Humanities Institute. Retrieved from https://humanitiesfutures.org/papers/environmental-activism-in-the-middle-east-prospects-and-challenges/

The Arab Weekly. (2022). *For MENA region, air pollution comes with an annual $141 billion bill.* Retrieved from https://thearabweekly.com/mena-region-air-pollution-comes-annual-141-billion-bill

Tull, K. (2020). *The projected impacts of climate change on food security in the Middle East and North Africa (MENA).* Institute of Development Studies. Retrieved from https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15166/764_MENA_food_security.pdf?sequence=1&isAllowed=y

UNHCR. (2021). *Climate Change and Displacement in Mena.* Retrieved from https://www.unhcr.org/6141fa9d4.pdf

UNICEF. (2021). *"Running dry": Unprecedented scale and impact of water scarcity in the Middle East and North Africa*. Retrieved from https://www.unicef.org/press-releases/running-dry-unprecedented-scale-and-impact-water-scarcity-middle-east-and-north

Varela, R., Rodríguez-Díaz, L., & DeCastro, M. (2020). Persistent heat waves projected for Middle East and North Africa by the end of the 21st century. *PloS one*, *15*(11), e0242477.

Vlachogianni, T., Vogrin, M., & Scoullos, M. (2012). *Biodiversity in the Mediterranean region*. Mio-ECSDE. Retrieved from https://mio-ecsde.org/wp-content/uploads/2015/02/En-Position-Paper-on-Biodiversity-in-the-Mediterrannean.pdf

Waha, K., Krummenauer, L., Adams, S., Aich, V., Baarsch, F., Coumou, D., ... & Schleussner, C. F. (2017). Climate change impacts in the Middle East and Northern Africa (MENA) region and their implications for vulnerable population groups. *Regional Environmental Change*, *17*(6), 1623-1638.

WHO. (2021, October 30). *Climate change and health*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health

World Bank. (2019). *Sustainable Land Management and Restoration in the Middle East and North Africa Region: Issues, Challenges, and Recommendations.* Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/33037/Sustainable-Land-Management-and-Restoration-in-the-Middle-East-and-North-Africa-Region-Issues-Challenges-and-Recommendations.pdf?sequence=1&isAllowed=y

World Bank Group. (2022, February 7). *Mena's polluted skies and seas hurt economies, livelihoods*. World Bank. Retrieved from https://www.worldbank.org/en/news/press-release/2022/02/07/mena-s-polluted-skies-and-seas-hurt-economies-livelihoods

World Bank Group. (2023). Retrieved from https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=ZQ&most_recent_value_desc=true

Yamouri, N. (2010, September). *Overview: Water Sector Brief*. The World Bank. Retrieved from http://web.worldbank.org/archive/website01414/WEB/0__CO-32.HTM

Zittis, G., Hadjinicolaou, P., Almazroui, M., Bucchignani, E., Driouech, F., El Rhaz, K., ... & Lelieveld, J. (2021). Business-as-usual will lead to super and ultra-extreme heatwaves in the Middle East and North Africa. *npj Climate and Atmospheric Science*, *4*(1), 1-9.