Climate Change in the MENA Region: Environmental Risks, Socioeconomic Effects and Policy Challenges for the Future

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The Middle East and North Africa (MENA) region has always been dependent on agriculture and climatic conditions since the dawn of civilization. The agricultural sector of what was once the Fertile Crescent is still crucially important and is the largest employer in many Arab countries (Waha et al., 2017). However, existing climatic and demographic trends cast serious doubts on its capacity to sustain the local population and economy in the future. On the one hand, climate change is likely to reduce water discharge, which is already dramatically low, by an additional 15-45% by the end of the century (Waha et al., 2017). This will have severe effects on agriculture, 70% of which is rain-fed (Selvaraju, 2013). On the other hand, the population in the region is expected to double by 2070 (Waha et al., 2017). The combined effect of these two trends may be twofold: (i) it may increase the import dependence on food, which is already high for several crops, making the whole region vulnerable to global price shocks; and (ii) it may cause/reinforce migration within and from the poor countries in the area, migration being one of the oldest defensive activities to protect against extreme weather events and agricultural productivity loss.

These consequences can obviously differ across MENA countries according to the income levels in each. Indeed, the MENA region is very heterogeneous in terms of economic and social conditions. We focus the present analysis on low- and middle-income (LMI) countries (Algeria, Djibouti, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia, Yemen, West Bank and Gaza) which are particularly vulnerable to the direct and indirect effects of global warming, due to a lower ability to adapt and adjust to complex environmental changes. Compared to countries such as Oman, Qatar, Saudi Arabia and Malta, in LMI countries in the area, institutional and socioeconomic factors (e.g. political instability, poor governance, low financial capitals and factor mobility etc.) pose stronger limits to adaptive capacity building. Despite this focus, the brief snapshot we provide is not negligible. The population in LMI countries (about 444 million people in 2017) represents a large share of the total population in the MENA region, accounting for 85 percent of the total population and 95 percent of the rural population, that is, of dwellers whose livelihoods are overall more reliant on environmental resources and services.

This article investigates the observed and expected effects of climate change in the MENA region, devoting particular attention to its consequences for the agricultural sector and food (in)security. We deliberately restrict our attention to just one of the many dimensions of climate change: the direct impact that the climate-agriculture nexus has on the poorest sectors of the population. These are the poorest of the poor who have no means to defend themselves from the consequences of climate change, except to migrate and thereby escape unsustainable life conditions.

Climate Change in the MENA Region

MENA countries are very vulnerable to climate change impacts as they are naturally affected by harsh cli-

mate conditions, extremely high temperatures, limited groundwater and rainfall and scarce agricultural and arable land. Due to the combination of water and precipitation scarcity, high population growth and geographic concentration of the population, this is the most water-stressed area in the world. Climate change has already been observed in the region and is expected to accelerate and intensify in the near future, amplifying those stressors already at play. Evidence collected by the IPCC (Niang et al. 2014) indeed confirms an overall warming process, both in terms of annual and seasonal average temperatures, number of days with heat waves and the drop in precipitation in recent decades in North Africa (although with some geographical variations), which cannot be explained by natural variability. The region is also predicted to experience future drying trends and temperatures increasing at a faster rate than the global land average, not only in terms of annual and seasonal average, but also in terms of heat waves. In other words, this region, which plays host to extensive semi-arid and desert areas, is becoming drier, exposed to peaks of extremely high temperatures and to water crises and chronic shortages. The consequences are likely to be severe, not only for economic activities but also for health or even human life. According to a recent study (Ahmadalipour and Moradkhani, 2018), even if global warming is limited to 2 °C, the heat-stress mortality risk for people aged over 65 is estimated to increase by three to seven times by 2100.

MENA countries are also particularly vulnerable to sea level rise due to climate change. About seven percent of the total population lives in areas where elevation is less than five metres above sea level and a large share of economic activities, major urban centres, agriculture and population is concentrated in coastal areas which are exposed to increasing risks of flooding, inundation, land erosion and salinization. The effect of sea level rise could be extremely disruptive for climate-sensitive activities, from tourism to agriculture and fishing, especially in the Mediterranean and Red Sea sub-regions, characterized by rich biodiversity and tourism attractiveness. A comparative study on 84 coastal developing countries, for instance, estimated that about 24 percent of MENA's coastal GDP and 20 percent of its coastal urban extent is exposed to sea level rise and storm surges, namely, around twice as much compared to the same indicators measured worldwide (Dasgupta et al., 2011). Low-lying coastal areas are particularly at risk. The World Bank estimates that the sea level rise could affect 43 port cities in the region, including Alexandria which could experience devastating effects, with more than 2 million people displaced in the case of a 0.5-metre rise,[1] in line with the IPCC's global estimated rise by the end of the 21st century.

From Agriculture and Food Security to Migration and Social Stability

Collateral and associated effects of climate change are particularly relevant for the agricultural sector, especially in semi-arid or coastal areas. They include reductions in crop productivity, salinization, desertification, exposure to flooding, increased water shortage, inadequate provision of water and crop residuals for livestock production, as well as worsening working conditions or a limited ability to work on outdoor tasks.

Moreover, present and future impacts of climate change represent additional pressures and risk factors for an agricultural sector which is already hemmed between:

— growing demand: in 2017, the annual population growth rate was 1.7 percent, the second highest rate in the world after sub-Saharan Africa (WDI, accessed in April 2019),
— decline in resource bases: wind and water erosion and unsustainable farming practices cause land degradation and salinity in rain-fed and irrigated farmland, respectively. More than half of the LMI MENA countries use groundwater at rates exceeding renewable internal freshwater resources (OECD/FAO, 2018).
— and strict constraints to supply expansion: only five percent of total land is arable and arable land per person is about 0.13 hectares (WDI, accessed in April 2019).

[1] World Bank. "Adaptation to climate change in the Middle East and North Africa region." http://web.worldbank.org/archive/website01418/WEB/0__C-152.HTM.

In the MENA region more than 61 percent of the population live in urban areas, with the employment share of the service sector at above 50 percent. Even focusing on LMI countries, the area includes major oil producers such as Algeria, Iran, Iraq and Libya. In this context, how relevant is the agriculture-development nexus?

In the MENA region, the agricultural sector produces less than 10 percent of total value added, but it accounts for 22 percent of total employment, a share that increases to 31 percent among women. In addition, about 70 percent of the poor live in rural areas (Nin-Pratt et al., 2018). Therefore, agriculture, albeit not the "leading" sector, is certainly strategic for development outcomes of weaker and poorer population groups, namely women, small farmers and agricultural workers. The role of agriculture is also crucial for environmental sustainability, food security, socio-political stability and migration.

Environmental sustainability. According to FAO data, in the Near East and North Africa, the agricultural sector accounts for approximately 85 percent of total available freshwater uses. In a context in which climate change intensifies water scarcity, any successful adaptation strategy needs to involve agricultural activities.

Food security. Food production requires land and water, two factors that are very scarce in the region. In the absence of appropriate and sustainable adaptation in farming practices, climate changes may seriously compromise the domestic resource base for food production. Other climate change effects on food security may be indirect. The region is a net food importer, meaning that food security also pivots on its ability to obtain access to food through international markets. In 2013, domestic agricultural production covered 65% of domestic agricultural consumption (with strong variations within the region, from 16% in the Palestinian Authority to 85% in Sudan and Iran). Limited domestic food production does not translate into food insecurity in high-income countries in the area. They can rely on large budgetary resources to cushion possible food price shocks, and they largely invest in acquisitions of farmland (and implicitly in the associated freshwater resources) abroad. These defensive strategies, however, may not be affordable for LMI countries. Therefore, to the extent that extreme and unstable climate events and conditions affect global food prices, they represent an additional exogenous risk factor for the food security of this group of countries.

Inclusive growth and socio-political stability. Food security is not the only dimension at stake. Climate change effects on agriculture and freshwater can interact with other critical factors in the region, such as the rural-urban divide and social or political instability. The region is characterized by high rates of unemployment, especially among the young, rapid urbanization, and a relatively large urban/rural gap in countries such as Egypt, Libya, Iran, Mauritania and Morocco. There is an overall consensus in the literature on structural change that productivity in the agricultural sector is one of the key factors for prosperity and an inclusive process of economic transformation. MENA countries are no exception. Indeed, according to a recent report by IFPRI and FAO on the region (Nin-Pratt et al., 2018), "sluggish growth in agriculture pushes migration from rural areas to the cities" (p. 9). In combination with the weak expansion of labour-intensive sectors and fast population growth, this has resulted in high unemployment and incomplete structural transformation. The adverse impacts of climate change on agricultural productivity can only aggravate this problem. Some observers (cf. Smith and Krampe, 2019) argue that in some countries, such as Sudan and Syria, protracted droughts and the resulting economic difficulties contributed to political instability. There is no consensus on whether climate change exacerbates conflicts, but this hypothesis can certainly not be automatically dismissed.

Migration. The climate change effects on agriculture are intertwined with another key trend in MENA countries, namely, migration. According to IOM (2019), the region accounts for 14 percent of the global international migrant stock and, in 2016, for 41 percent (over 16 million) of the global population of Internally Displaced Persons. Both temporary displacement due to flood and storm events and migration in response to slow-onset processes are likely to increase. This trend concerns not only internal movements, but also international immigration and emigration to outside the region. Finally, climate changes in sub-Saharan countries represent additional pull factors for migration to MENA as a destination or transit region. A recent study (Defrance et al., 2017), for instance, estimates that between tens and hundreds of millions of people could be forced to leave the Sahel by the end of this century because of agricul-

tural area losses due to the reduction in monsoon precipitation caused by ice sheet melting.

Concluding Remarks

The MENA region shows remarkable differences in economic terms across countries. However, all MENA countries share a common threat, which is that they are all highly vulnerable to climate change. The latter heavily affects agricultural productivity and food security in the whole area, but countries react differently in the MENA region based on their income level: high-income countries can afford self-protective activities, which are often energy-intensive and sometimes lead to further environmental damage, while LMI countries are mainly compelled to opt for migration and the overexploitation of water and land. Looking at the policy implications for migration, one of the central topics currently under debate in Europe, we can certainly conclude that the policies aimed at "closing the borders" are not only ethically questionable, but also shortsighted. Walls and/or port restrictions are unlikely to be able to prevent people from fleeing the unsustainable consequences of climate change any more than they can stop people from trying to escape conflicts. In both cases, migration can be a matter of survival. At the same time, global warming poses multiple and alarming social and economic challenges at national and regional levels. Concerns over climate change should inform all areas of public policy, starting with agricultural and development strategies. From this perspective, the scope of domestic policies, international cooperation and assistance for mitigation and adaptation goes beyond pure environmental protection. All these measures should instead be conceived as the ingredients of broader development strategies, from migration management and social stability to lowering poverty and inequality. Building bridges rather than walls across countries is a more sensitive approach to the climate change threat, which may harm people and countries differently, but does not grant immunity to anyone.

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