

## Background Paper for Rabat Workshop

September 10-11, 2011

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### Introduction

Climate change presents clear and present challenges to the social, political, and economic well being of North Africa and the Middle East<sup>i</sup> (MENA). There is broad consensus on this point; however, there are **significant variations** from country to country about what addressing these challenges entails. The region exists as a number of **unique matrices of geography, energy, security, and resource management** for which there are not yet coherent policies at all the necessary levels of domestic and transnational governance. A deeper and more sophisticated body of knowledge regarding the unique challenges facing the region must be developed in tandem with development of clearer political will, so that regional actors may progress down the path of informed, proactive adaptation. The alternative is a more costly path of deferred and impromptu reactions when environmental changes can no longer be ignored.

### Regional Overview: Geography, Climate, and Environmental Issues

The majority of the land in **MENA is arid or semi-arid dryland**. Rainfall is highly variable but overall tends to be scarce—52% of the region receives less than 100mm per year. Some areas, such as parts of Syria, receive as much as 1,500mm annually, though the rate of loss in all parts of MENA due to evaporation and runoff is quite high.<sup>ii</sup> The northern regions of Algeria, Libya and Egypt, as well as the bulk of Morocco, Tunisia, Iraq, and Iran are arid and semi-arid. Vast swathes of Algeria, Libya, Egypt, and the Persian Gulf states are classified as “hyper-arid” and are unsuitable for agriculture. These hyper-arid regions are ill-suited for habitation and have very low population density, though ‘desertified’ and some hyper-arid areas can be made available for human use through targeted rehabilitation and management schemes. Iraq, Lebanon and Syria are considered water-abundant.<sup>iii</sup>

Though **scientific consensus is elusive regarding how much and where precipitation is expected to decrease due to climate change, there is broad consensus that rainfall will decrease throughout MENA**. Any decrease poses an unequivocal problem for this already water-scarce region. This is in addition to as-yet undetermined changes in the frequency, intensity, and seasonal predictability of rainfall. The UN Convention to Combat Desertification has identified drylands as ecosystems in which the **challenges of climate change are most intimately linked to food security and poverty reduction**.<sup>iv</sup> Currently, four MENA countries are consuming more than 100% of their renewable water resources each year and

are dependent upon external sources to fulfill the remaining need. Water resource management and access are key players in the **food security, economic security, and political interactions** of all who live in this region. Yemen's environmental ministry estimates that over 7 million hectares have desertified, with up to 97% of its land currently having been significantly degraded.<sup>v</sup>

Nearly every MENA state borders at least one sea or ocean and to varying degrees will be affected by **rising sea levels**. The IPCC predicts a rise between 30cm and 1m for the Mediterranean over the next century<sup>vi</sup>; the majority of human habitation and economic activity is near coastlines, and as the ocean level moves upward countries such as **Egypt, Morocco, Algeria, and Tunisia can expect human displacement into the tens of millions of people**. Furthermore, **a rise in sea level reduces hectares of arable land and increases salinity in remaining arable land and groundwater supplies**. In Egypt, which is likely to experience some of the most dramatic changes due to sea-level rise, a rise of .5m would displace 3.8 million people and damage 1800km<sup>2</sup> of agricultural and industrial land concentrated along the Delta.<sup>vii</sup> Rising waters along with increased intensity of storm surges is expected to harm Morocco, Algeria, and Tunisia's tourist industries and to create highly significant human displacement.

**Desertification** has been underway in many parts of MENA for decades. This loss of arable land is due primarily to human activity such as overgrazing, deforestation, and erosion due to certain types of agriculture. Drylands are particularly sensitive to human use and require skilled management to be utilized sustainably. Without mitigation efforts and improvements in land management the advance of desertification will exacerbate other effects of climate change such as those described above. Much of the current information on desertification is based on empirical observation and incomplete data collection. There is consensus that land degradation and desertification is spreading, but to what extent and in which areas is difficult to pinpoint until more reliable data collection is in place.<sup>viii</sup>

**The economies of most MENA states are resource-dependent**, with environmental ramifications from current resource extraction techniques. In addition to petroleum-related activity, **Egypt derives 15% of its GDP from mining for gold, natural gas, phosphates, and petroleum. Morocco contains 75% of the world's phosphate reserves, and has one of the world's largest sand-mining operations**. As a result, ecosystems along the coast are degrading with significant detrimental effects on the health of wetland systems.<sup>ix</sup> Pollution from mineral extraction (along with increasing industrialization and urbanization) throughout the MENA is diminishing water quality and availability.

### **Participation in Climate Change Mitigation and Adaptation Efforts**

Nations have displayed a variety of attitudes and approaches toward addressing climate change and environmental issues. At the international level, all of the countries referenced herein have ratified the Kyoto Protocol and the UNFCCC. **Ten MENA states are currently funded by the Global Environment Facility**, primarily in the areas of capacity building, governance infrastructure, biodiversity

conservation, and energy efficiency. These nations' current project funding (in \$ millions):

Egypt (\$11.8);	Syria (\$4.95);
Turkey (\$19.4);	Morocco (\$4.5);
Iran (\$17.9);	Tunisia (\$3.5);
Algeria (\$9.25);	Jordan & Yemen (\$3.3 each).
Sudan (\$6.4);	

UAE, Israel, Qatar, Iraq, and Kuwait have no listed allocated funds, while Saudi Arabia, Bahrain, Libya and Oman each have \$3.3 million allocated to them but have elected not to utilize any of those funds.<sup>x</sup> As a point of comparison, in August 2011 the World Bank gave Egypt a \$247 million grant to upgrade its financial institutions and nearly \$2 billion to construct new power stations, and to upgrade railway and irrigation systems.<sup>xi</sup> **While the World Bank is providing funds to deal directly with climate change adaptation measures through the GEF, the lion's share of funding continues to go toward traditional development schemes that exacerbate climate change and do not support long-term adaptation needs.**

Nations are undertaking internal measures as well to manage domestic needs and challenges. **Economic diversification** is the focus of many countries' efforts to improve resilience, with Oman and UAE currently undertaking the more successful of such measures. Egypt has begun to take steps toward diversifying economically but has stalled somewhat in the face of the 2008 global economic downturn. Diversification has aimed at water resources as well. Among the most notable is the desalination efforts in UAE, which currently operates the world's largest desalination plant capable of processing 300 million cubic meters of water per year. As of 2008, desalination was providing 24% of the UAE's total water usage. Because the nation's Environmental Agency predicts depletion of its fresh and brackish water reserves by 2060, desalination may prove to be the key component of the country's water security.<sup>xii</sup> Bahrain, Israel, and Saudi Arabia have also undertaken desalination infrastructure, with the latter currently generating 50% of its municipal water supply from desalination.

## **National and Regional Interests**

National economies of nearly every country in the MENA region are **highly dependent on agriculture, petroleum, or both**. Agriculture is particularly vulnerable to changes wrought by climate change, and even more so because much of the **region's agriculture is cultivated on small, rain-fed farms**. The following is a list of countries whose national employment and/or GDP is most heavily based on agriculture.<sup>xiii</sup>

<b>As a percentage of the labor force:</b>	<b>Total population employed in agriculture:</b>	<b>As percentage of GDP:</b>
<ul style="list-style-type: none"> <li>• Ethiopia (85%)</li> <li>• Sudan (80%)</li> <li>• Yemen (75%)</li> <li>• Somalia (71%)</li> <li>• Tunisia (55%)</li> <li>• Morocco (44.6%)</li> <li>• Egypt (32%)</li> <li>• Turkey (29.5)</li> <li>• Iran (25)</li> <li>• Iraq (21.6)</li> <li>• Libya (17)</li> <li>• Syria (17)</li> <li>• Algeria (14)</li> </ul>	Ethiopia (32.2 million) Sudan (9.5 million) Egypt (8.4 million) Turkey (7.3 million) Iran (6.4 million) Morocco (5.2 million) Yemen (5.1 million) Somalia (2.4 million) Iraq (1.8 million) Syria (.9 million) Algeria (.8 million) Tunisia (.4 million) Libya (.3 million) <b>Total: &gt;80.7 million</b>	Somalia: 65% Ethiopia: 43% Sudan: 32.1% Syria: 17.6% Morocco: 17.1% Egypt: 13.5% Iran: 11% Tunisia: 10.6% Iraq: 9.7% Turkey: 8.8% Algeria: 8.3% Yemen: 8.2% Libya: 2.6%

The percentage of a nation's population and total number of individuals employed in agriculture is significant for several reasons:

- 1) **Without adaptation measures, climate change is likely diminish agricultural yields significantly in arid regions**, and will thereby reduce or eliminate the livelihoods of increasing numbers of farmers;
- 2) **Loss of livelihood leads to increased migration, regional instability, and increased political stresses**. In some scenarios, famine and starvation may result;
- 3) Countries whose GDP depends on agriculture will find themselves with steadily decreasing resources for addressing increasing mitigation and adaptation needs.

**The most immediate threat to current agricultural systems is diminished precipitation and changes in seasonal weather patterns**. For example, the average farm in **Morocco** is 1.6 hectares and most are dependent on rainfall rather than irrigation; Morocco is a net exporter of food when rainfall is high, but becomes a net importer of food when low rainfall diminishes crop yields, and in most years relies on imports to meet its staple food requirements.

**Egypt**, with the largest total farming population in MENA, has a very high rural population of landless farmers due to 1990's-era changes in land law. This landless population is among the most economically vulnerable under any

circumstances, and even more so if agricultural systems come under increased stress.<sup>xiv</sup>

**Yemen** is an example of a nation at a critical juncture in land management, and economic and social policy—this sector employs 75% of its population, yet the country is faced with a steady net decrease in groundwater supplies and land degradation. At present, 45% of Yemen's population is under the age of 15, indicating a sharply increasing number of people who are reliant on land that is decreasing in both quantity and productivity.

Changes in rainfall amount and season necessitate commensurate changes in infrastructure regarding selection of crops for cultivation, how harvests are stored, and grazing patterns for livestock. The process of transition from high-water, low value crops to low-water, high yield crops is underdeveloped and generally underfunded. **Farming as a business enterprise in most MENA countries is hampered by inadequate access to the financing necessary to make improvements and guard against climatological and world market volatility.**<sup>xv</sup> Furthermore, sustainable cultivation and rehabilitation of sensitive dryland regions requires comprehensive multi-stakeholder management schemes and sound scientific data collection. For example, **the UNCCD recommends reducing the amount of habitation and economic activity that is based on drylands.** This is a sound measure to prevent further desertification, but is one that requires holistic integration of scientific data, environmental management, and banking and other economic reforms.

**Petroleum-based economies include (oil revenue as % GDP): Iraq (60%); Qatar (50%); Saudi Arabia (45%); Kuwait (51%); Libya (25%); Yemen (25%); UAE (20%) and Bahrain (11%).**

Effects of the 'resource curse' upon governance institutions are well documented, and have been exhibited to varying degrees in the oil-rich nations. **World market volatility increases domestic economic instability** when an economy is dependent on one or two commodities, and even when prices are favorable, **national income does not necessarily translate to improved social and political conditions.** States with nationalized oil companies generate high government income, which in turn may be used to buy off dissent and perpetuate authoritarian governance.<sup>xvi</sup> High government spending in this context tends to diminish the innovation and economic diversity needed to cope with instability such as that of climate change.

In addition to agriculture as a large source of employment and oil a primary source of revenue for the overall region, there are a number of efforts aimed at diversifying economies in particular for those nations who are resource-poor or whose oil reserves are dwindling.

- **Egypt** derives 49% of GDP from the services sector, comprised mainly of banking, communications, and tourism. Industrial activity generates another 37% of GDP, albeit a portion of both the services and industry sectors are based on petroleum-related activity. Egypt has steadily become less agricultural, though still at a fairly robust 13% of GDP.
- **UAE**, with 25% of GDP from oil and gas production together, generates much of its revenue from banking and industry.

- **Oman**, with oil reserves declining steadily, has aimed to reduce oil revenue to 9% by 2020. In its place, Oman is targeting tourism and industry for the biggest areas of growth.
- **Yemen**, as described above, has derived most of its income from oil in the past but reserves are dwindling, which has induced efforts at economic diversification. The remainder of its GDP is generated in textiles, construction, and other industry, and the country has begun to develop its natural gas extraction potential.
- **In Lebanon**, 79% of GDP is from the service sector, particularly in banking. The nation's GDP/capita is moderately high for the region, and the population living under the poverty line has decreased from 28% in 1999 to less than 5% in 2010.
- **Israel's economy** is among the highest in total amount and per capita, and is based on high-tech communications, software development, and tourism.
- **Jordan** is a nation with low water and other natural resources, generates some GDP from industry and services, but remains highly dependent on foreign assistance.

### **Regional Challenges to Climate Change Adaptation**

Water scarcity and climatological volatility are hardly new phenomena for societies in the MENA region, and actors have developed a number of strategies for adaptation to those challenges. However, the region is facing a historical moment in which water resources and food productivity are declining alongside rapidly growing populations, with less land area for them to inhabit and for the cultivation of food. In addition, domestic governance and international relations present both opportunities and obstacles as the region moves forward. Below are outlined some of the most pressing challenges and other salient characteristics within the region.

#### **Water scarcity**

It is high and is expected to increase. Major bodies of water and above-ground waterways have been managed for many years, if not centuries, but seldom are governance systems in place that provide adequate oversight of wetland and groundwater systems and the efficient allocation of these water resources. Considering that the bulk of water resources serve agriculture, water shortages are likely to manifest most strikingly in diminished or failed agricultural productivity. Diminished agricultural output is not expected to lead to immediate food shortages in terms of gross food availability, but with diminished yields those whose livelihoods is derived from agriculture will lose market power to access the food that is available. Underemployment and food insecurity has been linked closely to the recent destabilization of political institutions in various parts of MENA, and governance systems can either be strengthened through mitigation and adaptation efforts in anticipation of climate change, or be further destabilized if food security diminishes as expected.

### **Domestic and International Conflict:**

Many analyses point to the high incidence of domestic and transnational conflict as a leading obstacle hindering the social and economic development necessary to successfully navigate climate change. At the risk of overstating conflict as a persistent characteristic of the region, social and environmental resilience has been persistently undermined by regional and international struggles. **Military spending commands a relatively high proportion of MENA countries' available resources**, particularly in the Persian Gulf and the Levant. **Of the world's 11 highest military spenders (as percentage of GDP), seven are in MENA:** Saudi Arabia, Oman, Qatar, UAE, Israel, Jordan, & Iraq.<sup>xvii</sup> Total military spending of these top seven is \$92 billion (in 2010 U.S. dollars), more than Iraq's and slightly less than Morocco's total GDP for that year.

**Recent and ongoing conflicts contribute to generalized instability in the region.** The "struggle to survive or profit from the reordering of the regional balance of power" following the 2003 overthrow of Iraq's ruling government (which had disastrous consequences on Iraq's infrastructure) continues to exert destabilizing effects on Iraq's neighbors.<sup>xviii</sup> **Waves of refugees** have migrated to Jordan and Syria primarily. Iran's nuclear progression has heightened tensions in the region and the possibility of a nuclear race remains plausible.<sup>xix</sup> The Israeli-Palestinian conflict continues to consume political and physical resources to a high degree, and strains international relations including cross-border environmental negotiations. Lebanon has suffered damage to its infrastructure and social stability from this ongoing conflict, and Palestinian refugees have tended to land in Jordan, Syria, Lebanon and Libya. Sudan and Somalia have both struggled with long-term civil war, creating political instability and sending waves of refugees into their neighbors. Turkey and Iraq have long struggled over the status of Kurds in Iraq, in conjunction with Turkey's internal ethnic struggles.

**Border and territory disputes are rather common, and though unsettled many of them seem to be 'cool' rather than 'hot' conflicts.** Lebanon, Syria and Israel have disputed borders, as do Syria and Jordan. Jordan relies heavily on the River Jordan, with headwaters in both Israel and Syria, and no clear plan for how the three nations will balance each nation's increasing demands while averting the complete devastation of the Dead Sea.<sup>xx</sup> Saudi Arabia and Egypt dispute control over two small islands; similarly, UAE and Iran also dispute control over nearby islands. Iran and Iraq are in disagreement over maritime boundaries. Morocco claims sovereignty over West Sahara, a claim that is rejected by Algeria and West Sahara itself. There are several disputes over water rights: Iran and Afghanistan; Iran with Russia, Azerbaijan, Kazakhstan (over the Caspian Sea); Turkey, Syria and Iraq over hydrologic projects on the Euphrates.

While it is generally assumed that resource scarcity engenders conflict, there are differing views about whether water scarcity increases the likelihood of conflict between nations, or whether in the long-term it is likely to lead to agreement.<sup>xxi</sup> There are three main above-ground water sources: the Tigris-Euphrates, Nile, and Jordan rivers, and conflicts are brewing or in full swing between Syria and Turkey, Israel and Jordan, Jordan and Saudi Arabia (for aquifer rights). Military confrontation inevitably damages water infrastructure and water quality, so

ironically, conflict over access to water decreases the amount of water available to all parties.

### **Regional Integration:**

A look at the ten largest economies in the region reveals two clear trends.

**The Persian Gulf states are economically linked with one another to a greater degree than with other MENA states.** Saudi Arabia, whose own primary trading partners all lie outside MENA, is nevertheless an important trading partner for states throughout the region and particularly the Persian Gulf. Kuwait receives 6.3% and Qatar receives 4.1% of its imports from Saudi Arabia. Egypt exports 5.8% to, and receives 4.5% of imports from Saudi Arabia. Qatar also receives 5.5% of its imports from UAE. Morocco receives 5.1% from Saudi Arabia as well. **Iran and UAE are linked**, such that the former gets 15% of its imports from UAE, who is its primary import partner; that figure comprises 6% of UAE's exports.

**Egypt is the largest economy with most of its primary trading partners within MENA--14.1% of its exports and 9.7% of imports are from within the region**, higher than any other nation. 5.8% of exports go to Saudi Arabia, 4.3% to Libya, and 4% to Jordan; 5.2% of imports are from Turkey, in addition to the 4.5% from Saudi Arabia.

Other notable trading partnerships include: **Iran's exports to Turkey; Turkey's exports to Iraq; Tunisia to Libya; Algeria imports to and exports from Turkey. All of Israel's primary trading partners lie outside of MENA.** As a whole picture this would indicate a high degree of integration into world markets, but also perhaps room for increased regional integration through trading.

**Migration between countries tends to follow predictable patterns. Africans (west and south) typically go to the southern EU, using Morocco as a transit point—though, increasingly, Morocco serves as a destination point for immigrants.** Moroccan, Tunisian, and Algerian emigrants typically enter the southern EU as well. **Emigrants from Egypt, Syria, and Lebanon go to the Persian Gulf region.**<sup>xxii</sup> Socio-economics tend to be the main drivers of migration, and remittances provide a considerable source of income for some nations—for example, 4% of GDP in Egypt, the largest shares coming from Kuwait, the UAE, and Saudi Arabia (and the United States).<sup>xxiii</sup> If, due to internal political pressure and their own resource challenges, EU (particularly southern) states tighten immigration policy this is likely to increase pressure on origin states and intensify resource stress in the North African states in particular. **The concept of “climate refugees” and climate change as a driver of immigration is fairly new;** it is difficult to determine the current extent to which environmental changes are driving migration, and to make accurate projections on how such migration might change in intensity and destination under different climate change models.

### **Youth Population and Employment:**

MENA countries have some of the most youthful and fastest-growing populations in the world. In Yemen, West Bank and Gaza, and Iraq, 40-45% of the population is under age 15. Saudi Arabia, Jordan, Syria, Egypt, and Libya have in the range of 30-39% of their population under age 15. Of these countries, Gaza, Yemen



and Libya have unemployment rates upwards of 30%, and West Bank, Iraq, Bahrain, Oman, Iran, and Tunisia have unemployment in the range of 14-16%. The “youth bulge” has long been noted in this area of the world with ambivalent analyses of what it might mean for the region. The relatively high (and growing) proportion of young adults could be a source of economic growth and political stabilization, while on the other hand this demographic could be what is often described in news and other reports as a “generational time bomb” if nations are unable to develop economic conditions and political institutions that satisfy the needs of coming generations.

### **Knowledge Gap:**

Political and economic institutions require sound scientific data to inform effective environmental governance. In general, there has not been sufficient data collection and analysis to confidently project how the environmental effects of climate change can be expected to intersect with the particular political and economic structures of MENA states. There is a dearth of endogenous knowledge on several levels, including scientific, political, and economic consequences of climate change, and about the most salient climate adaptation needs and abilities of regional actors. Sources from the region as well as from outside MENA cite the lack of scientific knowledge as a key barrier to effective adaptation and mitigation.

**This lack is attributed partly to “a long history of autocratic political systems and under-funding of research and development,” and to externally generated research which views the region as “partially in Asia and partially in Africa, countries in the region are often divided in official U.N. research and not given attention as a whole.”<sup>xxiv</sup>**

The World Bank and World Economic Forum are two institutions that do base policy on viewing the region as an interconnected whole. They tend to emphasize the function of adaptation measures in order to avert economic decline, which in turn would likely lead to a downward spiral of diminished environmental, political, and economic resilience and heightened trans-national conflict.<sup>xxv</sup> Without more thorough and regionally specific climate science, policy-makers even in the most politically favorable settings are hard-pressed to make informed and effective decisions.

### **International Intervention:**

As described above, bodies such as the GEF, World Bank, and IMF intervene financially throughout MENA, in ways both helpful and detrimental to the goal of climate change adaptation. Militarily, the United State’s invasion of Iraq sent waves of negative social, political, and economic repercussions through Iraq and into its neighbors. Politically, the world’s largest energy consumers, in particular the U.S, frame much of their foreign policy discourse with “energy security,” meaning steady and reliable access to petroleum and natural gas. However, considering how much influence the U.S. and other global leaders have in the Middle East, these leaders would do well to reconceptualize energy security in terms that consider the long-term well-being and prosperity for all concerned parties.

In terms of global economics a number of trends are emerging. China and India's populations are large and growing alongside rising standards of living. Coupled with industrialization and desertification (particularly in China), these nations are steadily moving toward export-dependence to fulfill their citizens' basic needs. Demands on global food markets are anticipated to grow, which, if present trends continue, may not bode well for the ability of MENA's agriculture-dependent yet water-scarce countries to maintain market stability and food security.<sup>xxvi</sup>

## **Conclusion**

It is problematic to attempt direct causal links between environmental changes and social instability; changes in the environment are not mono-causal drivers of migration, conflict, political turmoil, and the like. However, increased resource scarcity can readily be considered a multiplier of existing vulnerabilities such as poverty and underemployment, transnational conflict, and unstable national governance. North African and Middle Eastern countries can expect to face radical geographical and economic changes due to decreased and altered precipitation, sea-level rise. The geographic and climatological shifts resulting from climate change may not be avoidable, but subsequent economic vulnerability, and demographic and political upheavals can certainly be mitigated—with effective management schemes informed by comprehensive scientific study and enabled through political cohesion.

## Footnotes

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- <sup>i</sup> This report includes statistics on countries not traditionally included in MENA—Somalia, Ethiopia, and Sudan. These are included due to their close proximity to key MENA states and involvement in such areas as migration flows and water use agreements with Egypt.
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- <sup>xvii</sup> Stockholm International Peace Research Institute. Retrieved 10 August 2011, from <http://www.sipri.org>
- <sup>xviii</sup> Jones et al. 2009.
- <sup>xix</sup> *Ibid*.
- <sup>xx</sup> Chartres, Colin & Samyuktha Varma. *Out of Water: From Abundance to Scarcity and How to Solve the World's Water Problems*. New Jersey, US: FT Press. 2011.
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- <sup>xxiii</sup> International Organization for Migration, Cairo. Retrieved 9 August 2011 from [http://www.egypt.iom.int/Doc/IOM%20Migration%20and%20Development%20in%20Egypt%20Facts%20and%20Figures%20\(English\).pdf](http://www.egypt.iom.int/Doc/IOM%20Migration%20and%20Development%20in%20Egypt%20Facts%20and%20Figures%20(English).pdf)
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