The Potential Role of Climate Change in Conflict in the Middle East by the Year 2030

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“The existing situation makes [the Middle East] more susceptible to problems. Even small changes may have a greater impact here than they may have elsewhere... Any stresses on the rivers and aquifers can be a source of conflict.”

General Anthony C. Zinni, USMC (Ret.),
Former Commander-in-Chief of
U.S. Central Command

Introduction

In this paper, we explore the link between the effects of climate change that may occur by 2030 and conflict in the Middle East. We begin by describing the impact of climate change on key natural resources in the Middle East and discuss a theoretical framework that describes how climate change and its impacts could negatively affect regional stability and potentially push the region towards conflict. We then provide a brief survey of several existing conflicts (as well as a potential future conflict) and identify the role that climate change could play in the development of those conflicts. At the conclusion of our discussion, we provide a set of recommendations to mitigate and/or prevent these conflicts.

In order to assess the impact that climate change will have on the Middle East, this discussion assumes that the IPCC findings are sound and that significant climate change mitigation will not have occurred by the year 2030. In addition, throughout this work, conflict is defined as: state-on-state or internal armed fighting; state-on-state or internal political tensions; or group acts of violence or disorder.

Climate Change in the Middle East

The IPCC’s Fourth Assessment Report states that by the year 2030, in the absence of mitigative actions, global surface temperatures will increase by more than 1.5°F in comparison to the period between 1980 and 1999 [1]. Temperatures in the Middle East are predicted to rise at a faster than average rate, increasing between 1.8°F and 2.7°F [1]. By the year 2030, this temperature increase will stress the region’s water resources due to the resultant increased evaporation, decreased spring snow melt, altered precipitation patterns, and increased frequency of heat waves and droughts.

In addition to a decrease in the availability of water, the IPCC also predicts that the production of cereal yields, such as maize, wheat, and rice in the lower latitudes will be diminished. As these crop yields are expected to decrease with even a slight temperature increase, the Middle East will be particularly affected since it is expected to experience higher than average temperature increases and its regional crops are already growing at the high end of their temperature tolerance [1].
Climate Change and Conflict in the Middle East

As described in the previous section, climate change will have a direct and negative impact on water and food scarcity in the Middle East. Of course, water scarcity is not a new problem to the residents of the Middle East. In fact, nearly two-thirds of the Arab world depends on external fresh water sources. Of Middle Eastern countries, only Iran, Turkey, and Egypt have a sufficient supply. However, as climate change continues to exert its impact around the world in the coming decades, the existing instabilities due to water scarcity in the region will be accelerated and exacerbated. As described in our CNA study, National Security and the Threat of Climate Change, climate change will act as a “threat multiplier” for instability.

Research on environmental security demonstrates that resource scarcity leads to conflict through several mechanisms. Specifically, resource scarcity is significant because it leads to decreased supply (caused by resource degradation or a drawdown of a supply source), increased demand (caused by population growth or increased consumption), or inequities in distribution. Countries are vulnerable to each of these factors, particularly when the factors coexist or occur in combination with other social, economic, or political factors. However, while resource scarcity can be a causal factor of conflict, resource scarcity alone is not likely to cause state-on-state wars over resources; rather, the conflicts due to resource scarcity are “diffuse, persistent, and subnational.” In this paper, we will employ this framework to explore the role that resource scarcity (particularly water) has played in conflicts in the Middle East and to determine the possible impacts of resource scarcity caused by climate change.

In addition to the water and food scarcity that will occur in the Middle East as direct impacts of climate change, we expect that the scarcity of resources will result in an increase in human migration across the region. When faced with threats to water and food security, populations will either have to adapt to the threats or migrate to areas where the availability of resources is greater. These migrations could manifest themselves across a variety of geographical scales (e.g., local, across international borders, across vast geographical regions) and human environments (e.g., from a rural setting to another rural setting, or from a rural setting to an urban setting). As various regions of the Middle East have little adaptive capacity, the impetus to migrate could be great for some populations. Climate change-induced migration is particularly worrisome because the impacts around a region are likely to be long-lasting and thus may present complex difficulties to the receiving populations.

Migrations of populations in the Middle East could raise tensions in the receiving communities for several reasons. First, if the regions into which migrants flow are also

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1 One of the major impacts of climate change on the Middle East (and around the world) will be rising sea levels combined with an increase in extreme weather. However, we focus here on water and food scarcity as we do not expect sea level rise to have a major impact on the region by 2030.
resource-stressed, migration can increase competition for resources. Migration can also lead to conflict through its potential to create or exacerbate ethnic tensions, especially if migrants are a different ethnicity than the resident population. Similarly, migration can be problematic if migrants adhere to a different (or radical) political ideology or agenda. Finally, migration can lead to instability caused by the creation of large, semi-permanent refugee populations (as with the Palestinian population in the region). According to International Alert, “migration has to be recognized as not only a likely consequence of climate change, but also a major risk factor in the chain of effects that link climate change and violent conflict.” [7].

We should note that just as resource scarcity does not guarantee conflict, migration does not necessitate conflict. For example, in response to the ongoing hostilities in Iraq, millions of Iraqis have been both internally and externally displaced. The Office of the United Nations High Commissioner for Refugees estimates that between 1.7 million and 2.2 million Iraqis are now residing in Syria and Jordan, with smaller amounts spread elsewhere around the world (but mainly concentrated in other Middle Eastern countries) [8]. While these refugees endure hardships (including disease, unemployment, loss of education, and poverty), there have not been any acute conflicts that have arisen due to their presence.

However, while neither resource scarcity nor migration guarantee conflict, the combination of resource scarcity in a receiving population coupled with extensive migration into that population increases dramatically the likelihood of conflict.

Middle East Conflict Case Studies

In this section, we examine several prominent conflicts across the Middle East, exploring the role that resource scarcity and migration have played thus far, and how they may be exacerbated by climate change in the coming decades. We also discuss how climate change may aggravate resource scarcity and migration to the point of helping to spark a new conflict in the region.

Israel and the Palestinian Territories

Water scarcity and high concentrations of (non-climate related) semi-permanent refugee populations have played a central and continuing role in the conflict between Israel and the Palestinian Territories of the West Bank and Gaza Strip. In this ongoing conflict, the scarcity of water has contributed to tensions due to all three elements of resource scarcity: decreasing supply, increasing demand, and inequality of distribution.

For their water needs in and around the West Bank, both Israelis and Palestinians rely heavily upon an underground water source known as the Mountain Aquifer. The Mountain Aquifer supplies about one-fourth of Israel’s water and almost all of the West Bank’s water [9]. The Mountain Aquifer is divided into three subsections, known as the Eastern, Western, and Northern Aquifers. Prior to the 1967 war, water resources in the West Bank were not inflammatory since the Israelis depended almost exclusively on the Northern and Western Aquifers while the Palestinians depended almost exclusively on
the Eastern Aquifer. The situation changed, however, when Israel took control of the West Bank and Gaza Strip territories.

After the 1967 conflict, Israel imposed strict regulations on well-drilling by the Palestinians; in the few instances where licenses were granted, they were only for domestic use, not agricultural. As a result of their limited access and rapidly increasing population\(^2\), the per capita consumption of water among Palestinians is one of the lowest in the world. At the same time, Israeli settlers were allowed access to new wells and a much higher rate of water consumption. The perception of the Palestinians of unfair distribution, compounded by an increasing population and an inherently low water supply, has contributed to the high tensions in the West Bank.

The water situation in the Gaza Strip is also worrisome. The water supply for the residents of the Gaza Strip comes entirely from a portion of the aquifer known as the Coastal Aquifer \([10]\); there are no permanent rivers from which to draw fresh water for municipal or agricultural purposes. The issue of unfair distribution of water does not play a big role in the water scarcity in the Gaza Strip: while the Israelis limited access to wells after the 1967 conflict, the controls were never as strict as they were in the West Bank. In addition, the Palestinians in the Gaza Strip were given authority over their wells in the mid-1990s.

While distribution of water has not in large measure spurred the conflict in the Gaza Strip, diminishing and degraded supplies have combined with a rapidly increasing population to make the water crisis dire. The lack of tight restrictions has resulted in the aquifer being over-pumped for decades. Because the aquifer is being depleted faster than rainwater can recharge it and because the Gaza Strip population is rapidly increasing\(^3\), water levels have been dropping. In turn, these dropping water levels have caused the quality to suffer due to encroaching salt water from both the sea and underground saline water deposits. The increasing salinity of the water has caused problems to human health as well as to the Gaza Strip’s agricultural production.

The Israelis and Palestinians have attempted, however, to reach resolution on the sharing of water resources. Reaching an agreement on water resources has been a key component of Israeli and Palestinian peace talks since the early 1990s. Water rights to Palestinians were specifically recognized in Annex III, Article 40 of the Interim Status Agreement signed in 1995 \([11]\). However, while water rights for the Palestinians were discussed, the

\(^2\) The population of the West Bank in 2007 was reported as more than 2.5 million (of which 30-percent are refugees). The population growth rate is currently 2.99-percent, meaning the population will roughly double by 2030 at the current rate. The immigration rate is also positive. \([12]\)

\(^3\) The population of the Gaza Strip in 2007 was reported as nearly 1.5 million (of which 67-percent are refugees). The population growth rate is currently 3.66-percent, meaning the country’s population will more than double by 2030 at the current rate. The immigration rate is also positive. \([12]\)
issue proved to be too contentious and was left as one of the remaining issues to be solved in the Final Status Agreement [10].

As climate change progresses, a solution to the Israeli-Palestinian conflict will only become more elusive as environmental and population pressures combine to drive the Palestinian territories towards humanitarian disaster. Water resources will become even further depleted as overall precipitation decreases, intense rain events generate runoff that cannot be absorbed into the aquifers, and continued over-exploitation of the aquifers continues to degrade the water quality. As the agricultural sector suffers, 16-percent and 12-percent of the work force in the West Bank and Gaza Strip, respectively, will suffer decreased incomes and face unemployment [12]. To alleviate the crisis, it is likely that Palestinians will drill wells despite Israeli restrictions, which will only decrease the water supply at a faster rate [10]. The already meager income made by each territory through exportation of agricultural products will diminish further; each territory’s dependence on imported food (and most likely water as well) will increase. Water and food resources will play prominent roles in further peace negotiations [10].

While it should be expected that migratory pressures will grow as a result of the threat to water and food security, it is highly unlikely that migrations out of the territories and into the immediate regions will be allowed to occur. While migration may be a solution to decrease tensions, it is not clear that there will be a location to which the population can migrate: countries in the region are not likely to accept more Palestinian refugees nor is Israel willing to relocate them internally. While instability can sometimes open the door to radical ideologies, in this scenario, it is unclear how Hamas could take advantage of the situation as their ability to provide services to their constituents will be diminished.

U.S. security policy in the region would be best served by a peaceful negotiation and resolution between the Israelis and Palestinians. However, a peaceful resolution will only become more elusive as climate change and population pressures combine to drive the region towards humanitarian disaster. Humanitarian concerns could result in intensifying diplomatic pressures on Israel from the international community. U.S. influence in the region could be impacted over our support or disagreement with contentious aspects of peace negotiations.

Whether climate change will serve to accelerate the water situation to crisis levels before other factors intervene remains to be seen; however, the growing threat to water and food security and population pressures will only make the situation more tenuous.

Israel and Jordan
While resource scarcity has exacerbated the Israeli and Palestinian conflict, in recent years, Israel and Jordan have instead used water scarcity as a means to cooperate.

The northern portion of the border between Israel and Jordan consists of two of the most important surface waters in the region: the Jordan River and its main tributary, the Yarmuk River. While most of the drinking water in Israel and Jordan come from underground aquifers [10], the waters of the Jordan and Yarmuk rivers have been a
source of contention among not only Israel and Jordan, but also Syria, Lebanon, and the Palestinian West Bank. In fact, in the mid-1960s, when the Arab League began implementing a plan to divert water in the Yarmuk away from the Jordan River, Israel responded with military force. In the late 1980s, Israel also objected to the construction of a dam on the Yarmuk by Jordan and Syria over concerns about water sharing and control of the Yarmuk’s flow [9].

Division of water from the Jordan and Yarmuk Rivers played a central role in the Israel-Jordan peace treaty signed in 1994. In negotiating the treaty, Israel and Jordan found a workable solution to what they both saw as inequitable distribution of a scarce resource to which they both had a natural right. The treaty included an agreement on water allocation, Israel agreed to aid Jordan in finding additional drinking water supplies, and both countries stated a commitment to developing their water reservoirs and assisting each other in times of drought.

However, the effects of climate change threaten to stress the agreement between Israel and Jordan. In fact, tensions were already strained by a sustained drought in 1999 [10]. As droughts become more commonplace and the flow of the rivers falls over the coming decades, such tensions are likely to rise again; the two countries may be forced to either renegotiate or even disregard the treaty. A renegotiation or negation of the treaty could threaten the normalized diplomatic relations (and accompanying trade benefits) and could leave one or both countries in a more precarious water situation.

While the peace treaty between Israel and Jordan may be stressed, climate change may be likelier to cause an internal disruption within Jordan than directly threaten the peace with Israel. Unrest may generate within the population as climate change effects cause pressure on the refugee and economic situations. Jordan currently houses between 500,000 and 750,000 Iraqi refugees [8], nearly 2 million longer-term Palestinian refugees [12], and has approximately 160,000 internally displaced remaining from the 1967 conflict. If conditions in the West Bank lead to a humanitarian disaster, the international community may demand that Jordan absorb more refugees, a demand they are likely to resist. In addition, as agricultural productivity decreases, some of the workforce in the agricultural sector (about 5-percent of the labor force [12]) may be forced to join the 30-percent that are already unemployed.

As Jordan has become an important Sunni Muslim ally in the war on terrorism, internal disruptions may both prevent Jordan from fully engaging in regional counterterrorism activities and may leave its population more vulnerable to extremist tendencies. As such, the effects of climate change within Jordan should be of concern to the U.S. security community.

Turkey, Syria, and Iraq

Turkey, Syria, and Iraq also have the potential to erupt into conflict over resource scarcity. In this instance, the resource under pressure is the waters of the Euphrates River and the friction arises mainly from concerns over inequitable distribution. The water
The Euphrates River flows downstream from Turkey into Syria and then into Iraq. Turkey relies on the Euphrates for both power generation and irrigation; Syria and Iraq (to a lesser degree) depend upon the Euphrates for their water needs [9]. Turkey, in contrast, is a relatively water-rich country that receives sufficient rain to support agriculture even without irrigation. Even as climate change threatens to diminish the water supplies in the Eastern Mediterranean region, it is unlikely that Turkey will be in as poor a situation as Israel, Jordan, Syria, and the Palestinian Territories. In fact, Turkey may see their international status increase as their water resources could be used as a bargaining chip in diplomatic negotiations with other countries in the region [13].

Turkey, Syria, and Iraq have a contentious history surrounding their uneven access to the Euphrates. In fact, the decrease in water availability almost resulted in conflict in 1975, when Iraq threatened military action against Syria in response to an alleged reduction in the flow of the Euphrates caused by a Syrian dam. More recently, confrontations have arisen over a series of dams constructed across southeastern Turkey, particularly the Atatürk Dam completed in 1990 as part of Turkey’s large GAP infrastructure development project. Syria and Iraq strongly opposed the construction of the dam because of concerns that Turkey would possess a “water weapon” as the dam would allow them to decrease the flow of water downstream. Syria and Iraq both protested when Turkey interrupted the flow of the Euphrates for a month in order to initially fill the dam’s reservoir [9].

In the past several decades, the clashes over the resource scarcity in the region have been woven into another underlying source of tension: the Kurdish separatist movement. Turkey is home to 12 million Kurds, Iraq and Iran each house roughly 4 million Kurds [14], and a small Kurdish population also lives in Syria. For decades, the Turkish military has clashed with the small but violent Kurdish nationalist movement, the Kurdistan Worker’s Party (known as the PKK). In fact, one of the motivations of the Turkish government in pursuing its GAP project was to better the economic situation of the poor, and uneasy, Kurdish population in the southeast [9].

As conflicts have arisen among Turkey, Syria and Iraq over the “Kurdish question”, migration of the Kurdish population into Turkey has proven to be particularly problematic. Kurds flooded the region in 1991 in response to the international response to Iraq’s invasion of Kuwait, which resulted in Turkey closing the border. To avoid another large Kurdish migration due to the current Iraqi conflict, Turkey established a series of refugee camps prior to war in 2003 [15]. The goal of these camps was to dissuade Kurdish refugees from crossing the border and from remaining in Turkey permanently. Clearly, the Turkish government is unwilling to accept Kurdish refugees, even on a temporary basis.

As climate change and the resultant resource scarcity that could arise in Iraq and Syria continue to worsen, it is not unlikely that the Kurdish population in those countries may
seek refuge in relatively water-rich Turkey. Such a migration could set the stage for increased Turkish-Kurdish conflict that could spread beyond Turkey’s internal borders and into Iraq and Syria.

This type of scenario could pose a unique and difficult threat the U.S. security interests in the region. Although the future of Iraq in the 2030 timeframe is uncertain, it is conceivable that the U.S. military could be deployed in a destabilized northern Iraq. The U.S. would not want a direct confrontation with Turkey, as they are a fellow member of NATO and a potential future member of the European Union. Turkey is also a strategic ally in that they may counter Iranian influence in the region. As such, the prevention of a conflict surrounding the Kurds could turn out to be a cornerstone of U.S. actions in the region as climate change worsens the situation.

**Yemen**

Yemen has the potential to face both internal and cross-border conflict over water scarcity in the future as climate change worsens. While inequitable distribution has been the major theme of conflict in the above cases, conflict over Yemen’s water situation is more likely to occur over decreased supply (due to overuse, degradation of quality, and poor management) and increased demand (due to a rapidly increasing population4). Water scarcity-induced migration could also be a source of tension.

Decades ago, Yemen’s water resources were better than its neighboring states. However, in recent years, overuse has caused the depletion of many of their aquifers. Water quality has also diminished as a result of poor sanitation practices and increased salinity. As a result, there is severe water scarcity in the region. In fact, towns in Yemen’s western highlands have already been evacuated due to lack of available water for drinking and irrigation. [16]

The overuse of the water from the aquifers has been compounded by poor management and oversight; in fact, more than ninety-percent of the water is consumed by “unmanaged irrigation and government-sanctioned agriculture” [16]. One expert stated that Yemen has, “…a large and increasing population is competing with agriculture for limited water resources” [16]. More than a quarter of the water being used for agriculture goes towards the development of qat, a non-essential, non-nutritive crop that is favored by the local population because it is more lucrative than other crops and can induce a feeling of mild euphoria [17].

As a result of their water crisis, Yemen has experienced high unemployment, internal migration (in the form of rapid urbanization), and civil unrest [16]. In fact, the water situation has already prompted the minister for water and environment to propose a voluntary relocation program for residents of the capital city, Sanaa, one of the oldest inhabited cities on Earth [17].

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4 Yemen’s population growth rate in 2007 was reported to be 3.46-percent, meaning the country’s population will more than double by 2030 at the current rate. [12]
Even without factoring in the effects of climate change, Yemen’s water scarcity is expected to reach crisis levels by 2030 [16]. The decrease in precipitation due to climate change will serve to exacerbate and accelerate its water scarcity and migratory pressures. While the government is pursuing policies to alleviate the stress on its scarce water resources, it is unclear if these policies will be able to mitigate adequately the issue.

As water resources become even more scarce around the country, increased internal migration of could raise tensions in the region. As terrorism activity is already present in Yemen, it may prove more difficult to manage as civil unrest grows; rapid urbanization, and the ensuing disorder, may also allow terrorist groups to operate more freely. In addition, the decades-long conflict between northern and southern Yemenis could be reignited as the populations migrate. If Yemeni migrants cross the border into Saudi Arabia, an international conflict could ensue, perhaps necessitating U.S. involvement or complicating regional U.S. diplomatic relations.

**Recommendations for U.S. National Security Policy**

Due to the concentration of carbon dioxide currently in the atmosphere, some effects of climate change are certain to occur by the year 2030. While an international framework may be developed to mitigate and adapt to the catastrophic effects that could occur by the end of the century, the impacts that will occur by 2030 cannot be significantly decreased. As such, the effects of climate change (such as water scarcity, food scarcity, and migration) are likely to exacerbate existing conflicts and play a role in creating future conflicts. In effect, climate change could act as the “straw that breaks the camel’s back” when it compounds the issues presented by other resource, economic, social, and political factors. That is, climate change could serve to push the region beyond a tipping point, beyond which instability turns into conflict.

Clearly, as the root issue of climate change is greenhouse gas emissions, any serious attempt to deal with the effects of climate change must tackle the emissions problem. Since greenhouse gas emissions are discussed widely in the policy realm, we instead focus our recommendations on how the U.S. can help prevent climate change from aggravating conflict in the Middle East.

When examining the chain of events that lead to potential conflict, we see the following chain of causality: increased greenhouse gas emissions leads to increased temperature; increased temperature leads to a variety of environmental effects, such as changes in precipitation patterns, increased droughts and floods, increased heat waves, and increased evaporation rates; these environmental effects could lead to resource scarcity (specifically water and food); resource scarcity could contribute to human migration.

In this chain of events, if we put aside targeting greenhouse gas emissions, the areas in which U.S. influence can alleviate conflict-related conditions are combating resource scarcity and human migration. As U.S. policy options are more limited at the end of the chain, we feel that the U.S. would be best served by focusing on preventing resource
scarcity in the Middle East. The following recommendations are focused at each element of resource scarcity discussed above: increased demand, decreased supply, and inequitable distribution. We also suggest a change in the strategic plans of the U.S. Central Command. Our final recommendation focuses on examining the long-term effects of climate change on important coastal regions.

The U.S. should adopt a strategy of seeking international agreements on water allocation: Using the 1994 Israeli-Jordanian agreement over water allocation as a model for the region, the U.S. should actively pursue sustainable water agreements throughout the Middle East. Such bi-lateral and multi-lateral agreements could alleviate potential future conflicts by spurring the regional players to see water as a tool of cooperation instead of another barrier to regional peace. The benefits of such treaties serve not only to reduce tensions around a scarce resource, but (as they did with Israel and Jordan) can also improve diplomatic and trade relations. By serving as an honest broker in water allocation disputes, the security of the U.S. could also improve as a result of improved trust and credibility across the region.

The U.S. should use the power of the purse to influence regional water policy: The U.S. should consider including water-related metrics as a condition of foreign aid. Providing an economic incentive for achieving certain water-related benchmarks could help lessen present and future tensions over inequitable distribution. Specifically, the U.S. should consider metrics focused on increasing levels of water equality (in terms of both price and access), increasing water conservation, and decreasing wasteful and non-beneficial agricultural practices. The foreign aid made contingent upon these metrics could be funds that are available as a bonus amount not included in the usual foreign aid package.

The U.S. should provide technical assistance in water infrastructure development: Some of the poorer regions in the Middle East, such as the Palestinian Territories and Yemen, would benefit greatly from improvements to their water infrastructure. The U.S. military could assist in providing engineering and technical assistance through U.S. Navy Seabees and U.S. Army Corps of Engineers. Care should be taken to integrate these efforts with the ongoing work of USAID and international partners (including Japan, Germany, and Sweden).

Examples of improvement projects would include:
- replacing underground pipes,
- constructing or improving desalinization plants,
- constructing waste water treatment facilities, and
- helping to identify new, untapped water supplies (as Israel pledged to do with Jordan)

Side benefits of such missions include a betterment of diplomatic relations, improvement of America’s image to the local populations and governments, and avoidance of future and present tensions and migrations over water and food scarcity.
To secure at least partial financing for these improvement projects, the U.S. should approach the wealthier nations in the region, such as the United Arab Emirates (UAE). The UAE, in particular, has demonstrated a commitment to implementing clean energy solutions and has the resources available for such large projects. Strengthening relations with the UAE could in turn lead to them being a valuable ally in negotiating the bi- and multi-lateral water allocation agreements described above.

The Department of Defense should include water and food scarcity alleviation in the military operation orders of U.S. Central Command: To ensure that resource scarcity receives the proper level of attention from the combatant command responsible for the Middle East, the U.S. Central Command leadership should leverage mandate further investigation of the ways that climate change-induced resource scarcity could affect the region, identify areas where scarcity is most likely to occur, determine appropriate military actions to aid in the alleviation of any recognized scarcity, and make contingency plans based on the threat of resource scarcity-induced conflict.

The U.S. Central Command should employ its capability of military-to-military communications to promote the development and training of civil action teams: As U.S. Central Command already has lines of communication established with the militaries of the region, they should consider organizing conferences and training sessions to provide training in infrastructure development. By employing the militaries of the region, the U.S. could multiply the extent and impact of regional water infrastructure development projects. Particular attention should be paid to sharing and transfer of clean, efficient water and energy technologies. The regional leaders may be particularly receptive to activities with U.S. Central Command as many are former military officials.

Funding for the preceding three recommendations could originate from the budget of either the Department of Defense or the Department of State (through the International Military Educations and Training (IMET) grant program or in the Foreign Military Financing (FMF) account).

The U.S. government should incorporate long-term effects (i.e., effects by 2050, 2075, and 2100) of climate change into its strategic doctrine regarding Middle East policy: While we have described how climate change could affect conflict in the Middle East by the 2030-timeframe, we expect that the negative impacts of climate change on the region will become more prevalent towards the latter half of the century. While in this paper we focus mostly on the effects of resource scarcity, the combination of increases in extreme weather events and sea level rise could combine to be a major threat to many critical coastal areas of the Middle East. Particular areas of focus should include:

- Abu Dhabi, UAE: In recent years, Abu Dhabi has evolved into a regional (and global) power and has witnessed tremendous growth and investment. Major

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For example, from 21 to 23 January 2008, the UAE hosted the World Future Energy Summit, a meeting that showcased green energy technology. See: www.wfes08.com
damage to the area could result in economic turmoil not only locally, but across the world.

- **Aden, Yemen**: Much of the port of Aden, a city of vital importance to Yemen, rises only a few feet in elevation, making it susceptible to extreme weather and increased storm surges.

- **Bahrain**: Bahrain is a key strategic ally of the U.S. in the Persian Gulf region, housing the headquarters of the U.S. Navy’s Fifth Fleet. Much of Bahrain’s critical infrastructure (such as refineries, desalination plants, and the Arab Shipbuilding and Repair Yard Company) is located along the coastline at an elevation of only a few feet.

- **The Nile Delta, Egypt**: The area of the Nile Delta will experience great damage by rising sea levels. The increased sea levels and storm surges threaten to erode much of the low-lying land areas, salinate the water supply, and cripple the region’s agricultural production. The IPCC estimates that nearly 8 million people could be displaced across the Nile Delta and the city of Alexandria. Such a massive human displacement and economic disruption is likely to trigger civil unrest within Egypt and the city of Cairo (the likely destination for the internally displaced population).

References


