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CLIMATE CHANGE, ENVIRONMENTAL MIGRATION, AND CONFLICT: THE CASES OF EGYPT AND SUDAN

by

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CLIMATE CHANGE, ENVIRONMENTAL MIGRATION, AND CONFLICT: THE CASES OF EGYPT AND SUDAN

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ABSTRACT

Does climate change cause migration, and if so, are areas that host environmental migrants more prone to conflict? Using Sudan and Egypt as case studies, this thesis examines the effects of climate change on migration and how that influx of people leads, or fails to lead, to conflict. This research determines that climate change can, but does not necessarily, cause migration, and that environmental migrants can add stress to already volatile situations but are unlikely to cause conflict as a sole variable. Despite this uncertain linkage between climate change and conflict, it is still important that we take actions to address climate change before conditions deteriorate to the point that it constitutes a more severe security threat.

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LIST OF ACRONYMS AND ABBREVIATIONS

CPA	comprehensive peace agreement
GCC	Gulf cooperation council
GDP	gross domestic product
GERD	grand Ethiopian renaissance dam
IDP	internally displaced persons
IMF	international monetary fund
IPCC	intergovernmental panel on climate change

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I. CLIMATE CHANGE, ENVIRONMENTAL MIGRATION, AND CONFLICT

A. MAJOR RESEARCH QUESTION

Climate change is often assumed to generate conflict, but to date no generally-accepted link has been found. Yet, while climate change may not have a consistent effect, it is likely that it has affected some conflicts, but what could be the connection?[1] The most plausible and widely cited linkage between climate change and conflict has been environmental migration.[2] The link between environmental migration and conflict is not clear, however.[3] Scholars, think tanks, and political figures have posited that climate change will drive anywhere from 200 million to 1 billion people away from their homes as a result of desertification, drought, sea level rise, and temperature increases, but these estimates on the level of climate-induced migration are well beyond what has occurred thus far.[4] While forecasts have been updated, the difficulty in modeling the precise characteristics of future climate change and the complex interrelating factors that lead people to leave their homes have made projections difficult. As scholars have yet to provide consistent results on linkages between climate change, migration, and conflict, these connections need to be studied further. With or without conflict, academics largely agree that climate change will significantly impact migration going forward.

Does climate change cause migration and if so, are areas that host environmental migrants more prone to conflict? This thesis seeks to examine the effects of climate change

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[1] Syria and Darfur, among others, have been used as case studies for climate change induced conflict.

[2] Ragnhild Nordås and Nils Petter Gleditsch, "Climate Change and Conflict," *Political Geography* 26, no. 6 (2007): 630; Kate Burrows, Patrick. Kinney, and Jan Semenza, "Exploring the Climate Change, Migration and Conflict Nexus," *International Journal of Environmental Research and Public Health* 13, no. 4 (March, 2016): 447, https://doi.org/10.1016/j.polgeo.2007.06.003.

[3] Rafael Reuveny, "Climate Change-Induced Migration and Violent Conflict," *Political Geography* 26, no. 6 (2007): 668, https://doi.org/10.1016/j.polgeo.2007.05.001,

[4] Kate Burrows, Patrick Kinney, and Jan Semenza, "Exploring the Climate Change, Migration and Conflict Nexus," *International Journal of Environmental Research and Public Health* 13, no. 4 (March, 2016): 448, https://doi.org/10.3390/ijerph13040443.

on migration and how that influx of people leads, or fails to lead, to conflict. To investigate how internal migration from environmental changes affects conflict, directly or indirectly, in the unstable Middle East, this thesis focuses on the cases of Egypt and Sudan. Sudan and Egypt are already facing varying levels of water and food scarcity from diminishing replenishable water supplies that have been mismanaged through poor governance and adversely affected by climate change. While good governance has the potential to mitigate and adapt to scarcity, governments in the region have not lived up to governance standards. They have not adapted outside of supply-side fixes, such as desalination facilities, which fail to prepare their nations for probable threats associated with climate change.[5] When governments fail to address these issues, citizens act, and migration has become an adaptation technique to help meet resource scarcity demands. Although difficult to isolate as an individual factor, this population influx may be a catalyst for conflict due to its exacerbation of previous issues in the gaining cities and the pressure that additional people add to the mix.

B. SIGNIFICANCE OF THE RESEARCH QUESTION

Environmental degradation and resource scarcity are not new phenomena in the Middle East. Still, the negative effects of climate change are beginning to intensify, which is likely to exacerbate the underlying problems present across the region. With poorly governed states prevalent, adaptation and mitigation techniques are ineffective to non-existent in some states as those states lack the social capital and technical knowledge that are required to adequately deal with the challenge.[6] Climate change can be seen as a "threat multiplier" that will make future conflict more challenging to solve.[7] To properly plan and prepare for this pending reality, research into how climate change has affected migration and how the influx of migrants into existing social structures could lead to conflict is

[5] Scott Greenwood, "Water Insecurity, Climate Change and Governance in the Arab World," *Middle East Policy* 21, no. 2 (June 2014): 141, https://doi.org/10.1111/mepo.12077.

[6] Jeannie Sowers, Avner Vengosh, and Erika Weinthal, "Climate Change, Water Resources, and the Politics of Adaptation in the Middle East and North Africa," *Climatic Change* 104, no. 3 (February 2011): 601, https://doi.org/10.1007/s10584-010-9835-4.

[7] OECD, "The Outlook for Fragile States," in *Fragile States: Resource Flows and Trends* (Paris: OECD Publishing, 2013), 94, https://doi.org/10.1787/ 9789264190399-8-en.

needed. With this knowledge, good governance could act as an intervening variable and potentially reduce the severity of the threat and prevent conflict. If conflict does occur and the international community becomes involved, understanding the root cause will enable effective strategies to reestablish peace.

Scholars acknowledge the relative importance of climate change but are divided on how it will shape potential for conflict. By examining climate change and migration in the Middle East, this thesis will delineate how climate change could lead people to migrate and how this migration could then develop into conflict. Through understanding this linkage, governments will be able to direct aid in such a way as to reduce the friction points that precede conflict and help shape how countries are addressing resource scarcity. While many scholars have focused on models that forecast how climate change will affect the environment, looking at how people react to resource scarcity and environmental degradation can help shape concrete solutions to these future problems, however severe they may be.

C. LITERATURE REVIEW

The literature on climate change, migration, and conflict can be broken down into two research questions relevant to this thesis: does climate change cause migration and does this environmentally-induced migration cause armed conflict? Within the first question, whether climate change causes migration, scholars largely agree that it can, but it does not necessarily do so in all cases. Those who disagree largely argue that stressors from climate change can be adapted to and mitigated by governments and market driven technical solutions. Academics differ on the type and amount of migration they anticipate, but the majority expect it to be concentrated in urban centers within the state.[8] Scholars disagree more in the second area of research as to whether environmentally-induced migration acts as a key driver of conflict, a minor factor leading to conflict, a factor in stressing the resource allocation systems in receiving communities beyond capacity that

[8] Burrows, Kinney, and Semenza, "Exploring the Climate Change, Migration and Conflict Nexus," 449.

could then lead to conflict, or a non-factor that hides the more important conflict generating variables of poor governance. These camps will be addressed in the following section.

1. Climate Change Causes Migration

One of the earliest and most influential scholars shaping the debate on environmental conflict is Thomas Homer-Dixon. Advancing the early work of Malthusian scholars that claimed scarcity would lead to conflict as society reached a point beyond sustainability of food production, Homer-Dixon looked into the various types of scarcity and how people would attempt to respond to them. While focused primarily on conflict, his analysis did touch on migration and serves as a starting point for analysis as other scholars built off of what he studied. He saw migration as a potential outlet and likely to be directed towards urban centers within the nation, as they are the nearest area that people can go to have a better chance of addressing their needs.[9] Migration then leads to its own set of problems, particularly in developing countries with low state capacities. When people migrate, the migrants can exacerbate existing social, ethnic, class, or religious cleavages in the receiving communities and cause an increased demand on the state for water, food, infrastructure, and services.

Building off Homer-Dixon's early work, Rafael Reuveny examined climate change specifically and how it affects migration and eventually conflict. To forecast how climate change will affect migration, he researched how people have responded in the past several decades to environmental stressors. People facing challenges associated with climate change will stay in place and accept the new status quo, stay in place and adapt, or migrate.[10] This decision on whether to remain or migrate is dependent on rational analysis by those affected as they decide whether migration offers a net benefit larger than remaining in place.[11] While his analysis focuses on voluntary migration, it leaves out instances when people are forced to move due to severe weather events or slow onset events that make land untenable due to newly deteriorated conditions. In this, his migration

[9] Homer-Dixon, *Environment, Scarcity, and Violence, 179.*

[10] Reuveny, "Climate Change-Induced Migration and Violent Conflict," 657.

[11] Reuveny, 658.

analysis assumes that the decision to migrate comes out of a rational choice and excludes instances of forced migration. With the addition of these forced migrants to his analysis, climate change is even more likely to displace people in the future, particularly in countries that are less developed and less able to adapt to the climate changes at the government policy level.[12]

Similar to Reuveny's approach, Koko Warner et al. see the same three choices in their research but have a different view on the decision making process within those choices. They see migration occurring when coping and adaptation strategies fail and thus migration is more of a decision of last resort when living situations become untenable.[13] Although it is difficult to isolate the pure environmental push factors, water scarcity is likely to be a large driver of this migration as countries under water stress make up one-third of the world population while having only 8% of the world's water resources.[14]

Continuing the trend of case study analysis to determine the effects of climate change on migration, Helen Adams and Susan Kay studied how people have reacted to cyclones, hurricanes, and coastal erosion to predict how people will respond to future weather events. Adaptation through migration was shown in their research, with family members moving to cities in order to send back remittances to cope after weather events.[15] When adaptation was no longer an option due to severe and enduring negative effects from disaster, large scale out migration begins to occur, which in turn leads to further migration as the sending communities receive positive feedback along with a loss of viability in their own community.[16] They see climate change increasingly becoming a more important driver of migration going forward as conditions worsen. Scott Greenwood used Jordan as

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[12] Reuveny, 659.

[13] K. Warner, M. Hamza, A. Oliver-Smith, F. Renaud, and A. Julca, "Climate Change, Environmental Degradation and Migration," *Natural Hazards* 55, no. 3 (December 2010): 691, https://doi.org/10.1007/s11069-009-9419-7.

[14] Warner, Hamza, Oliver-Smith, Renaud, and Julca, 691.

[15] Helen Adams and Susan Kay, "Migration as a Human Affair: Integrating Individual Stress Thresholds Into Quantitative Models of Climate Migration," *Environmental Science and Policy* 93 (2019): 130, https://doi.org/10/1016/j.envsci.2018.10.015.

[16] Adams and Kay, 130.

a case study and offered unique insights into the linkage as there have yet to be environmental migrants in Jordan.[17] While migration has not occurred yet, underlying poor governance and water scarcity are issues that he sees as likely to worsen if migration does occur. As Jordan is a country with weak governance and poorly enforced laws, his study shows how government policies can make environmental conditions worse as they fail to adequately adapt to deteriorating economic conditions.[18]

Many scholars have demonstrated the viability of the link between climate change and migration. To further the analysis the World Bank commissioned a report in 2018 to understand and prepare for climate change. This report built off the earlier research to forecast the likely effects of reduced water availability, reduced crop productivity, rising sea levels, storm surges, and extreme weather events. To adapt to these challenges, people in affected areas will migrate internally to urban centers, with the poorest countries being the worst hit as they are least able to adapt.[19] Additional factors in the Middle East will make climate change worse as agricultural dominated economies and large demographic growth trends make the environmental impacts more severe.[20] While they do not see a straight line between climate change and migration due to the complexity of the decision making process, it is an important factor. Similar to the future looking World Bank report, Clionadh Raleigh and Henrik Urdal used a model-based approach to determine how climate change links to migration. Their modeling showed climate change not acting as part of a complex decision making process but more directly forcing migration as a result of the degradation of renewable resources, rising sea levels, and extreme weather events.[21] While some of these events are slow onset, lower developed nations will be less able to

[17] Greenwood, "Water Insecurity, Climate Change and Governance in the Arab World," 151.

[18] Greenwood, 148.

[19] Rigaud, Kanta et al., *Groundswell: Preparing for Internal Climate Migration*, (Washington, D.C.: World Bank, 2018.), 4.

[20] Rigaud et al., 78 and 105.

[21] Clionadh Raleigh and Henrik Urdal, "Climate Change, Environmental Degradation and Armed Conflict." *Political Geography* 26, no. 6 (2007): 676–7, https://doi.org/10.1016/j.polgeo.2007.06.005.

adapt to these challenges and reduce the eventual environmentally-driven push to migrate.[22]

As researchers have shown the migration link, policy makers have pushed for solutions and proposals, with the 2016 Implications for U.S. National Security Report being a prime example. This report forecasts an increase in migration, which will in turn lead to competition over limited resources.[23] Even if conflict is not generated, migration is likely to exacerbate social and political tensions in the receiving areas, which can overwhelm governments in weak nations. This forecast is common in policy-making circles as an increasing number of politicians and leaders see climate change as a driver of migration and conflict.[24] To conclude this school of thought views migration as likely to occur in response to environmental degradation caused by climate change. The majority of that migration is expected to be from rural to urban within a state as those negatively affected seek to regain, and/or improve, their standard of living. The timing and level of migration varies between scholars as some view it as a process of last resort while others see migration as an adaptation technique that will be increasingly used in order to send remittances back to the family. As conditions continue to deteriorate, there is largely a consensus in this camp that migration will become widespread as affected communities lose their viability.

2. Technical Pursuits Can Prevent the Need for Migration

Many scholars established a link between climate change induced scarcity and migration, but there are some that see migration as an unlikely outcome. As common estimates about the vast number of displaced people not coming to pass, this camp has some valid critiques. Technical solutions can address climate change induced scarcity, but some nations may have an ingenuity gap that prevents them from being able to pursue these policies. However, these solutions have mostly been through the use of supply-side fixes,

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[22] Raleigh and Urdal, 675.

[23] *Implications for U.S. National Security of Anticipated Climate Change*. Washington, District of Columbia: National Intelligence Council, 2016, 6–7.

[24] Nordås and Gleditsch, "Climate Change and Conflict," 628–9.

methods to increase the water supply such as desalination or waste water renewal, that have proven to be useful in providing water to nations with depleting supplies.

Gökçe Günel examines the ability of states, with particular attention to Saudi Arabia and the United Arab Emirates, to provide water to their citizens in a manner that has prevented migration in water scarce regions. These countries suffer from absolute water scarcity and yet the state has been able to provide through desalination technology.[25] Multiple iterations of technology have made desalination increasingly efficient and able to provide for water-scarce regions. Although this has proven to be an effective short-term fix for scarcity that has prevented migration from occurring, there are many issues with this approach both presently, and into the future. At present, the creation of water through desalination has led to people viewing water as an infinite resource, which has in turn kept them from reducing their demand.[26] The continued depletion of groundwater aquifers and natural fresh water sources make the states even more reliant on desalination going forward.[27] As countries in the region increasingly turn to desalination and fail to meet demand, the excessive use of these facilities will turn the Gulf increasingly saline and less effective in producing potable water. There have already been effects in the Gulf of the negative aspects of desalination in increased occurrence of red tides.[28] Without curtailing demand through taxation or water pricing, these issues will be made worse going forward and migration could become a possibility where it had not before.[29] Government driven solutions can work to address scarcity and prevent migration, but they must go beyond merely providing additional resources.

An additional constraint on desalination that Günel mentions is more thoroughly shown by Jeannie Sowers, Avner Vengosh, and Erika Weinthal. While technological

[25] Gökçe Günel, "The Infinity of Water: Climate Change Adaptation in the Arabian Peninsula," *Public Culture* 28, no. 2 (May 2016): 292, https://doi.org/10.1215/08992363-3427463.

[26] Günel, 292.

[27] Günel, 295.

[28] Günel, 299. Red tides are large concentrations of algae blooms that are caused by changing water conditions that have adverse affects on fish and marine plants.

[29] Günel, 300–302.

solutions have been proposed as an answer to resource scarcity, Middle Eastern governments, like many governments in the developing world, lack the social capital and technical expertise to adequately deal with the increasing demands of growing populations and the stress on resources they engender.[30] Oil-rich states such as Saudi Arabia and the United Arab Emirates can focus on research and development for new desalination technologies because of their overwhelming monetary resources. Most other states lack the disposable income and knowledge base necessary to pursue these endeavors. The limited human, technical, and social capital make market driven solutions difficult to pursue and even when achieved, resources tend to go to more privileged groups within society.[31] Additionally, as state-driven adaptation techniques require good governance and popular support, authoritarian regimes in the Middle East lack the social contract necessary for climate change adaptation.[32] States that are unable to direct large sums of money at the problem need buy-in and cooperation from their people to address the issue. Here the Middle East is at a disadvantage because many governments in the region have relied on patronage driven systems that have minimized citizen involvement in government policies. Without citizen cooperation, non-oil governments lack the resources and ingenuity to adapt successfully. Additionally, for those nations in the region that do not have deep fiscal reserves, the money for adaptation would have to come from the international community. The stipulations of International Monetary Fund (IMF) loans would make long-term investments exceedingly difficult to pursue, if viable at all.

A further complication is the fact that economies that are heavily involved in agriculture are more likely to be adversely affected by water scarcity. Even with more advanced technical solutions, drought and increasing water and soil salinity make farming less viable as a reliable source of income.[33] State driven agricultural improvements such as waste water renewal and improved irrigation have allowed for less water to be used in

[30] Sowers, Vengosh, and Weinthal, "Climate Change, Water Resources, and the Politics of Adaptation in the Middle East and North Africa," 610.

[31] OECD, "The Outlook for Fragile States," 97.

[32] Sowers, Vengosh, and Weinthal, "Climate Change, Water Resources, and the Politics of Adaptation in the Middle East and North Africa," 601.

[33] Rigaud et al., *Groundswell,* 78.

the economy, leaving more for the direct use of citizens, but states have predominantly focused this water supply on urban centers at the expense of the rural citizens.[34] Despite the agricultural sector using the most water in many nations, crop productivity has decreased and led to declining profits.[35] With this heavy usage of water, any drought or decrease in availability leads to devastating effects on the agricultural community and increasingly contributes to pushing farmers out of the profession. The subsequent decrease in food production can lead to price increases if governments do not subsidize staple foods. With farming becoming a less viable method to pursue a livelihood, this can become a push factor for migration away from rural areas to cities.

Most scholars agree on the linkage between climate change induced scarcity and migration, but we have seen there are some who deny this link and point to the ability of the markets and governance to address the needs of citizens. While this has proven effective for some nations, they face increasing stressors that make their current adaptation techniques potentially unable to address scarcity as conditions deteriorate due to climate change.

3. Environmental Migration Can Cause Conflict

There is a wide variety of literature on the nexus of environmental migration and conflict, with the focus of study mainly being on the receiving community. To begin again with Homer-Dixon, he identified three types of conflict: simple scarcity, group identity, and relative deprivation. Simple scarcity conflict is interstate conflict in an area over finite resources as people attempt to seize control of resources essential to human survival.[36] Group identity conflicts deal with the in and out group dynamic created when different

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[34] Sowers, Vengosh, and Weinthal, "Climate Change, Water Resources, and the Politics of Adaptation in the Middle East and North Africa," 614.

[35] Andy Spiess, "Developing Adaptive Capacity for Responding to Environmental Change in the Arab Gulf States: Uncertainties to Linking Ecosystem Conservation, Sustainable Development and Society in Authoritarian Rentier Economies," *Global and Planetary Change* 64, no. 3 (December 2008): 247, https://doi.org/10.1016/j.gloplacha.2008.10.008.

[36] Thomas Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict," *International Security* 16, no. 2 (October, 1991): 107, https://doi.org/10.2307/2539061.

segments of society are competing over resources.[37] As environmental migrants rush to cities, this group identity dynamic can be created as the previous residents view the new arrivals as an out-group that they have to compete with. The relative deprivation conflict is created when segments of society see themselves as not getting enough compared to other people after the arrival of migrants.[38] While conflict could arise from these scenarios, he sees the possibility for many factors to break the causal links.[39]

Similar to Homer-Dixon, Reuveny sees four possible channels where conflict can arise from environmental migration: competition over resources, ethnic tension, distrust, and socioeconomic fault lines. Competition conflict arises when the receiving area is overburdened by the migrants and the native population has an escalatory competition with them for scarce resources.[40] Ethnic tension conflict can arise when the migrants are of a different ethnic group than the gaining community and they feel threatened as a result.[41] Distrust conflict is more a product of international migration, which is deemed to be less likely than internal migration, as the host nation believes the source nation has hostile intent in allowing migrants to travel to the new area.[42] Finally, socioeconomic fault line conflict can arise when rural to urban migration brings agricultural and pastoralists in competition with traditional city dwellers who feel threatened by the influx of people from a different way of life.[43] These four conflict types are not guaranteed to occur, but can be addressed by the state, particularly if the flow of migrants is slow as they gradually use migration as an adaptation technique to climate change induced scarcity.[44]

Separately from categorizing the conflict types, many scholars see the conflict potential arising due to a strain on resources in the receiving city as the influx of people

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[37] Homer-Dixon, 108.

[38] Homer-Dixon, 109–110.

[39] Homer-Dixon, 114.

[40] Reuveny, “Climate Change-Induced Migration and Violent Conflict,” 659.

[41] Reuveny, 659.

[42] Reuveny, 659.

[43] Reuveny, 659.

[44] Reuveny, 660.

helps to create a condition where the previous circumstances can be made worse. Peter Gleick explains this dynamic of migration being a "multiplier on social and economic pressures already at play."[45] The World Bank report also shows that any existing patterns of conflict can be reinforced under climate change stressors, including migration.[46] While Nordås speaks to the contested nature of the literature, he does point out the linkage of environmental migration stressing resources in already resource scarce receiving communities and the potential for conflict that this engenders.[47]

This body of literature generally agrees on the adverse water trend projections in the Middle East, along with other negative effects of climate change, and sees conflict potential growing as conditions deteriorate.[48] Climate change and migration are unlikely to be the primary or only cause of conflict, but they are likely to act in conjunction with underlying issues that are present in receiving communities. This makes conflict more likely if governments are unable to adequately deal with their needs.[49] Importantly for the Middle East, climate change may cause more scarcity than governments are able to overcome as some governments are weak, but more importantly, they may face extreme scenarios that make parts of nations unlivable.[50]

4. Environmental Migration Does Not Cause Conflict

As academics proposed theoretical links between environmental migration and conflict, other scholars began to examine the topic to determine the viability of the proposed connections. Syria served as the case study for Jan Selby et al. as they examined in detail the proposed linkages between climate change and drought, drought and environmental migration, and migration and the ensuing civil war that previous scholars

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[45] Peter Gleick, "Water, Drought, Climate Change, and Conflict in Syria," *Weather, Climate, and Society* 6, no. 3 (July 1, 2014): 334, https://doi.org/10.1175/WCAS-D-13-00059.1.

[46] Rigaud et al., *Groundswell*, 27.

[47] Nordås and Gleditsch, "Climate Change and Conflict," 631–632.

[48] Burrows, Kinney, and Semenza, "Exploring the Climate Change, Migration and Conflict Nexus," 451.

[49] Burrows, Kinney, and Semenza, 451–2.

[50] Burrows, Kinney, and Semenza, 453–4.

had laid out. Their research showed that drought did have an effect on migration in Syria, but it was to a much lower degree than that proposed by proponents of the climate-conflict nexus.[51] Additionally, environmental variables were merely part of the complex decision-making process that migrants were undertaking as they made the decision to migrate.[52] Far from being the primary factor for migration, environmental issues help mask the underlying poor governance and negative effects of neoliberal reforms that had taken place within the nation.[53] The next connection they focused on was the migration-conflict link where they noted weak evidence that the movement of people acted as a shock to cities that overstressed the capability of the state. The conflict that followed was not sparked by demands for alleviating the drought or plight of the migrants, but addressing the corrupt government that had crushed civil rights, political freedoms, and economic opportunities.[54] Overall, Selby et al. concluded that climate change could be a factor in the conflict but claims of its primacy do not stand up to academic scrutiny.[55]

Francesca De Châtel also examined the case of Syria and concurred with Selby et al. in its possible but minor role. She stresses that in overstating the importance of climate change, academics are helping to divert attention away from the main issue that led to the conflict; the long-term mismanagement of natural resources.[56] There were underlying issues that shaped the conflict as well, but focusing on an outside factor removes the central responsibility of the Assad regime. Migration from the countryside to the city had been occurring as a result of economic reforms in the nation that had stressed the ability of farmers to provide for their families and whole families had been migrating to the cities as

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[51] Jan Selby et al., "Climate Change and the Syrian Civil War Revisited," *Political Geography* 60, no. C (September 2017): 237, https://doi.org/10.1016/j.polgeo.2017.05.007.

[52] Selby et al., 238.

[53] Selby et al., 239.

[54] Selby et al., 240.

[55] Selby et al., 241.

[56] Francesca De Châtel, "The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution," *Middle Eastern Studies* 50, no. 4 (July 4, 2014): 521, https://doi.org/10.1080/00263206.2013.850076.

a result.[57] More people did show up at urban camps for the displaced as a result of the drought, but the camps had already been in place for over ten years.[58] On top of the economic reforms, Syria had an "inefficient, corrupt, and rigid water management system" that facilitated "large-scale overexploitation of water and land resources."[59] This exacerbated poverty and increased migration from the country through rural disenfranchisement.[60] In her opinion, focusing on climate change is "not only irrelevant; it is also an unhelpful distraction" that steers focus away from the underlying issues of poor governance, corruption, and economic mismanagement that shaped the conflict.[61]

Riley Post et al. see food and water scarcity as just part of the causal chain leading to conflict, even with migration as an intervening variable. In attempting to find what causes both scarcity and conflict, they see climate change as not necessary or sufficient to explain conflict.[62] Initial food and water grievances are often compounded by governmental mismanagement as rural farmers migrate to cities. As food insecurity is significantly linked with weak institutions and faltering economies and the more fragile a society is the more susceptible it is to violence, conflict is more of a governance problem than a climate change or environmental migration one.[63]

Existing circumstances already pose difficulties for governments in the Middle East and climate change is very likely to make these underlying issues worse. Depleting aquifers, desalination capacity failing to meet rising demand, and agricultural inefficiencies that make basic food subsidies more expensive all combine to make urban environmental migration a volatile mix and potential source of conflict. With this as a backdrop to climate change, and conflict already prevalent in the region, the Middle East will face increasing

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[57] De Châtel, 526.

[58] De Châtel, 527.

[59] De Châtel, 529.

[60] De Châtel, 529.

[61] De Châtel, 532.

[62] Riley Post et al., "Rethinking the Water-Food-Climate Nexus and Conflict an Opportunity Cost Approach," *Applied Economic Perspectives and Policy* 38, no. 4 (2016): 573, https://doi.org/10.1093/aepp/ppw027.

[63] Post et al., 571–572.

factors that make conflict more likely. The region may be in a situation where the severity of resource scarcity is too difficult to overcome. This thesis will build from existing literature to examine whether and how this conflict arises to better understand the potential problems of tomorrow.

D. POTENTIAL EXPLANATIONS AND HYPOTHESES

Rural to urban migration is increasingly becoming an adaptation technique for people facing resource scarcity caused by environmental degradation and poor governance.[64] Other factors are involved in the decision to migrate, but scarcity is a strong variable in the decision-making process. Migration from sending areas is likely to increase as conditions deteriorate and money being sent home may be unable to provide for the needs of the families. This increased migration can create new issues in cities that are already poorly governed and create situations where conflict is possible. The main hypothesis of this proposal is that conflict is created when large numbers of environmental migrants move to cities and overtax the resources to a point that scarcity is created in the receiving area. Conflict can be generated in two ways: citizens demand resources from the government and are repressed, which leads them to fight back, or the us-versus-them dynamic created by an influx of people leads to conflict between groups as they compete over limited resources. The alternative hypothesis is that conflict does not result from this migration. Whether the government is able to provide additional resources, successfully repress the demands of its citizens without violence, or people just live with their situation, conflict is avoided because environmental-induced migration does not create conditions that engender conflict.

E. RESEARCH DESIGN

Egypt and Sudan will function as the two case studies in this thesis. Egypt faces extreme climate stressors due to sea level rise, desertification, and scarcity, which have already driven citizens to migrate within the nation to the Cairo delta area.[65] With this

[64] Adams and Kay, "Migration as a Human Affair," 130.

[65] Warner, Hamza, Oliver-Smith, Renaud, and Julca, "Climate Change, Environmental Degradation and Migration," 703–4.

internal migration, combined with a recent history of civil strife, government repression, and coups, the linkage between migration and conflict in migrant-receiving areas can be explored. As Egypt faces multiple adverse effects from climate change, this thesis can analyze whether those varied conditions drive migration and conflict more strongly than other factors. The linkage between climate change induced scarcity and migration can be observed through analysis of data on droughts, rainfall totals, and level of Nile flooding into agricultural areas and the ensuing food and/or water scarcity it could cause. If there is migration, it can then be compared against previous migration cycles to determine the effect climate change had on migration. Next, this research can look at the receiving communities and investigate what instances of violence there were and what the nature of that violence is.

Sudan, meanwhile is facing a humanitarian crisis, with overlapping issues related to protracted internal conflict and scarcity-induced migration.[66] As such, Sudan poses a contrast to Egypt in the case study analysis, as it exhibits more severe and prolonged violence that can be broken down over multiple iterations to analyze the most important causal factors. With both localized and more general conflict, Sudan offers a wealth of opportunity to study the relationship between migration and conflict. Climate data will be used to determine the extent that climate change has adversely affected the environment in the two nations, with NGOs providing data on the levels of internal migration resulting from scarcity and climate-induced stressors. Analyzing the varied government responses to migration will help determine whether and how conflict is mitigated by policy and if scarcity can be overcome before it leads to conflict.

F. THESIS OVERVIEW AND DRAFT CHAPTER OUTLINE

This thesis is organized into four chapters. The next chapter analyzes the specific dynamics of climate change in driving migration in Egypt and if that migration has caused conflict. The third chapter investigates the same dynamics, but focuses on Sudan, which

66 Ibtisam Eljack, Mutasim Ali, and Mohammed Osman, "Irregular Ethiopian Immigrants and Urban Labour Market in Eastern Sudan: The Experience of Sudanese Employers in Gadarif Locality," *Journal of Business Studies Quarterly* 8, no. 1 (September, 2016): 65, http://search.proquest.com/docview/1831706659/.

has seen more consistent environmental migration and conflict. Finally, the fourth chapter will bring the results of the previous chapters together to compile lessons learned and analyze projected climate change and its influence on future population movement. This chapter will conclude with analysis of policy options for adaptation and mitigation that can reduce the adverse effects that climate change can create.

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II. THE CASE OF EGYPT

> "The frustrations of living in Cairo and other Egyptian cities increase daily. This is a function of population explosion, of urban migration, and of an infrastructure which was sorely neglected for 25 years. … Cairo's water, sewage, transportation, and telecommunications are all woefully inadequate."
>
> —1979 State Department Memo[67]

> "What will happen when there are 70 million of us, keeping in mind that resources do not increase at the same rate as population? … What about houses, food, education, medical treatment, and many other needs for [these] millions? Where will we get these things?"
>
> —Egyptian President Hosni Mubarak 1988[68]

> "Egypt with 20 million people could have been a Mediterranean country, a Greece or Portugal. Egypt with 70 million people will be Bangladesh"
>
> —Former Minister Boutros-Ghali[69]

A. INTRODUCTION AND CHAPTER OVERVIEW

The most populous nation in the Middle East, Egypt offers an interesting case study for analysis on the nexus between climate change and migration and between migration and conflict. While most scholarship on the issue has looked at conflict and then analyzed the effects of environmental migration, Egypt provides a counterpoint. By not attempting to directly prove or disprove the linkage and merely studying a nation that is undergoing climate change, the case of Egypt can provide unique insights into how and why people decide to move and the effects that climate change has on such decisions. Absence of

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67 Gerasimos Tsourapas, *Politics of Migration in Modern Egypt: Strategies for Regime Survival in Autocracies*, (Cambridge, UK: Cambridge University Press, 2018), 165.

68 Tsourapas, 163.

69 Tsourapas, 168.

movement can provide takeaways on what led people to not migrate as the literature suggests they should.

In Egypt, a growing population, limited natural resources, and overburdened urban systems are interlinked challenges that are likely to be exacerbated by climate change.[70] This chapter analyzes the underlying pressures of demographic change and urbanization, water scarcity and overreliance on the Nile, reduced agricultural productivity, and a history of government inaction and policy failures. Current effects of climate change in Egypt are then explored and likely future impacts discussed. Next, the levels of migration in Egypt are examined in three levels: intrastate migration, emigration, and outside refugee flows through the state. Finally, I investigate the linkage between this migration and conflict. This analysis concludes that while climate change has some effect on migration, and strong effects on Egypt going forward, the levels of internal migration are currently too low to create conflict as the literature suggests.

B. DEMOGRAPHIC CHANGE AND URBANIZATION

Egypt is the most populous nation in the Middle East with official totals surpassing 100 million citizens as of February 2020.[71] Despite this large population, Egyptians are forced to live almost entirely along the borders of the Nile River and into the Delta region. This area is about 40,000 km^2 and is also where the arable land is found.[72] The rest of the nation is largely desert and this leaves 96% of the population living in an area between 4% and 6% of the total landmass. The recent rise in land being used for development and housing has been a result of the rapid urbanization occurring around Cairo and Alexandria where some estimates have now put the total land usage between 6% and 7%.[73] As a result

[70] Clemence Finaz, "Egypt Country Risk Brief," 2015, A New Climate for Peace, 1.

[71] Declan Walsh, "For Thousands of Years, Egypt Controlled the Nile. A New Dam Threatens That," *New York Times*, February 9, 2020, https://www.nytimes.com/interactive/2020/02/09/world/africa/nile-river-dam.html

[72] Hassan R. El-Ramady, Samia M. El-Marsafawy, and Lowell N. Lewis, "Sustainable Agriculture and Climate Change in Egypt," In *Sustainable Agriculture Reviews*, ed. Eric Lichtfouse. (New York, Springer, 2015), 41.

[73] Institute for Strategic Studies, *Climate Change, Violence and Young People*, 7, https://www.international-alert.org/sites/default/files/Climate_ViolenceYoungPeopleUnicef_EN_2015.pdf

of this, approximately half of Egyptians live in urban areas centered around Cairo, Alexandria, and the Nile Delta.[74]

The population in Egypt is not only large and concentrated, but it is growing. Just three years ago population estimates were in the low 90 millions with a growth rate of 2% per year projected.[75] Predictions for the future vary but all show continued growth. From one million additional Egyptians per year to a doubling of the population over the next 50 years, Egypt will only become more populous and face increased density in the already burdened urban areas.[76] Density in the Nile Delta is already beyond 1,600 people per km^2 and the United Nations is predicting severe water and energy shortages as soon as 2025.[77]

This population boom is not coming from immigration, but a large rise in the younger generation, which has created a youth bulge. Over 54% of the populace is under 24 years old.[78] With the population already concentrated in the cities, this demographic is further fueling overpopulation and a reduction of state ability to provide basic services. This lack of access to basic services has created a sense of relative deprivation in the youth, which poses a current and future challenge for the Egyptian regime as it has the capability to erode the social contract.[79] Additionally, large youth populations increase the risk of violence in semi-democratic and transitional regimes, categorizations that accurately describe the political situation in Egypt today.[80] Another issue from this rising population is the negative impact on housing in urban areas. More young people are living in informal settlements and other marginal housing developments that directly put them at a higher risk

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[74] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 41.

[75] Jean-Daniel Stanley and Pablo L. Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," *GSA Today* 27, no. 5 (May 2017): 6, https://doi.org/10.1130/GSATG312A.1.

[76] Walsh, "For Thousands of Years, Egypt Controlled the Nile." & Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 10.

[77] Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 10.

[78] Institute for Strategic Studies, *Climate Change, Violence and Young People*, 7.

[79] Finaz, "Egypt Country Risk Brief," 2.

[80] Institute for Strategic Studies, *Climate Change, Violence and Young People*, 15.

for natural hazards and disasters.[81] These settlements are the most likely to be negatively impacted by climate change due to their impermanent and substandard nature. They also lack proper water and sewage services. This puts the youth at a higher risk of negative impacts from climate change.[82]

The final issue within this changing urban environment and youth bulge is the rise of the informal labor market that has occurred simultaneously. The large informal economy is estimated to be between 48% and 70% of the total economy and approximately 61% of GDP.[83] This has been fueled by migrants to cities and the rising youth population that are unable to find jobs and turn to this alternative economy. Youth unemployment has risen from 25% in 2010 to over 37% in 2014, with the more educated having higher unemployment rates than the lesser educated.[84] Estimates now put youth unemployment between 30% and 40% and with approximately 800,000 new entrants into the labor market every year, it is likely to become even worse.[85] Adding to this is the phenomenon of labor shortages in certain sectors of the economy as skilled workers often go abroad for higher pay and remaining workers lack the necessary skills for available jobs.[86] As the government attempts to address these issues, economic growth is threatening the quantity and quality of water resources and demands will only increase.[87]

C. WATER SCARCE NATION AND RELIANCE ON THE NILE

The Nile River is the very lifeblood of Egypt. It supplies 97% of Egypt's water and with precipitation incredibly low in the highly populated lower Nile Basin and Delta, it is

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81 Institute for Strategic Studies, 18.

82 Institute for Strategic Studies, 4.

83 LO/FTF Council, *Labour Market Profile: Egypt 2016*, (Copenhagen, Denmark: Danish Trade Union, 2017), 12–13, http://www.ulandssekretariatet.dk/sites/default/files/uploads/public/PDF/LMP/lmp_egypt_2016_final2.pdf.

84 Andrea Teti Et al., *The Arab Transformations Project. Political and Social Transformations in Egypt: Work Package 7*, University of Aberdeen, 2015, 105, https://doi.org/10.13140/RG.2.2.19389.26080.

85 Andrea Teti Et al., 107; LO/FTF Council, *Labour Market Profile: Egypt 2016*, 8; World Bank Youth Unemployment, June 2020. https://data.worldbank.org/indicator/SL.UEM.1524.ZS?locations=EG.

86 Tsourapas, *Politics of Migration in Modern Egypt*, 176.

87 Finaz, "Egypt Country Risk Brief," 1; LO/FTF Council, *Labour Market Profile: Egypt 2016*, 8–10.

essential for providing the water needs for Egyptians.[88] There has been an illusion of abundance with little awareness or political desire to plan for alternative water sources with such a major river within the state.[89] Despite this illusion, reality is harsh. Egyptians receive approximately 700 m^3 of water, one of the world's lowest per capita water shares, and well below the average of approximately 1000 m^3.[90] Additionally, the Nile River Basin is considered closed as all of the renewable flows are being used to meet human demands and freshwater withdrawals from the Nile are at 94% of the renewable rate.[91] In addition to being below the standard level, water managers typically view annual water availability of less than 1,700 m^3 as a significant constraint on socioeconomic development; development that is necessary in Egypt.[92]

Reliance on the Nile puts Egypt at risk to any negative impact on the river, whether that be natural or man made. The World Bank predicts that unmet water demand could increase 11 fold in Egypt by 2050 as population increase accounts for 4/5 of the total and the remainder a result of climate change.[93] Adding to this strain is the uneven distribution and mismanagement of the water supply as rural areas receive significantly less water services than those in the cities.[94] Access to clean water was one of multiple issues that youth labeled as their gravest concerns leading to the Arab Spring demonstrations in Egypt.[95] Separately, as the Nile is becoming overtaxed, aquifers that Egypt could turn to that cross national borders are being overexploited by Libya, which further constrains

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88 Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 10.

89 Finaz, "Egypt Country Risk Brief," 1.

90 Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 10.

91 Caitlin Werrell and Francesca Femia, *The Arab Spring and Climate Change: A Climate and Security Correlations Series*, (Center for American Progress, Stimson, The Center for Climate and Security, 2013), 45, https://cdn.americanprogress.org/wp-content/uploads/2013/02/ClimateChangeArabSpring.pdf.

92 Werrell and Femia, 45.

93 Werrell and Femia, 46–47.

94 Institute for Strategic Studies, *Climate Change, Violence and Young People*, 8.

95 Werrell and Femia, *The Arab Spring and Climate Change*, 47.

alternative water sources.[96] Regardless of cross-border issues or climate change reducing the flow of the Nile, the rapid population rise in Egypt will likely dramatically increase demand on water supply and government services.[97]

The final key factor regarding reliance on the Nile is the nearly complete Grand Ethiopian Renaissance Dam (GERD) and the geopolitical tensions that have arisen between Egypt and Ethiopia because of it. Egypt has long considered the Nile its purview and upstream nations were supposed to comply with whatever demands Egypt had on management of the river. Ethiopia has become a stronger player as they developed vis-à-vis Egypt with Nile river management and the GERD as the strongest expression of this. Egypt has the Aswan High Dam and Lake Nasser, but the GERD will become the largest dam on the Nile and potentially reduce the flow by up to 25% while also reducing the electricity generating potential at Aswan.[98] The speed that Ethiopia uses in filling the dam is key to the negative impacts on Egypt as the lake will be approximately the size of London and severely reduce downstream flow if filled up quickly.[99] Sudan is in between the two nations and has traditionally sided with Egypt, but as they stand to benefit from the GERD, they are siding with Ethiopia. There have been multiple iterations of international talks on the dam brokered by the United States and World Bank that have failed.[100] Any reduction in flow could be very detrimental to Egypt due to their overreliance on the Nile and their near maximum use of the resource. The political fight continues, but Ethiopia has pressed forward with the dam construction. Political dynamics aside, hydrologists emphasize that the most pressing issue is not the dam, but population growth and climate change.[101] One proposed solution for Egypt's water demands is to reduce their agricultural production and transition to another industry. This would reduce the amount of water necessary for

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96 Werrell and Femia, 3.

97 Ethan Coffel Et al., "Future Hot and Dry Years Worsen Nile Basin Water Scarcity Despite Projected Precipitation Increases," *Earth's Future*, 973, https://doi.org/10.1029/2019EF001247.

98 Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 10.

99 Walsh, "For Thousands of Years, Egypt Controlled the Nile."

100 Walsh.

101 Walsh.

agriculture, but it would make Egypt even more reliant on other nations for food imports, which is politically untenable.[102] As President El-Sisi has said, "The Nile is a question of life, a matter of existence to Egypt."[103] The importance of the Nile will remain paramount to Egypt going forward.

D. AGRICULTURAL SECTOR PRODUCTIVITY

Overpopulation and reliance on the Nile carry directly over to the third underlying condition in Egypt, decreased agricultural productivity. With a rising population and a finite living area, there is competition over whether to use that area for urban development and housing or for agriculture and food production.[104] This competition is not only for space, but also for water usage. Farmers have to decide on whether to produce staple foods for domestic consumption or more high-value, water-intensive crops that can be sold abroad. As only 4% of Egypt is suitable for agriculture, a rising population curtails both the capacity to provide for citizens and competes with their basic service requirements.[105] Egyptian scholars estimate that agricultural production needs to increase by 70% in order to keep pace with the population, a task that is increasingly difficult as agricultural land is lost in the face of urban expansion.[106] Agriculture is so important in Egypt that it is listed as a basic component of the national economy in the 2014 constitution with 20% to 30% of the population employed in the industry.[107] Despite this importance, neoliberal reforms from the 1980s onwards have created inefficiencies in the sector with inequalities and

[102] ECC Factbook, "Dispute Over Water in the Nile Basin," 6–7.

[103] Walsh, "For Thousands of Years, Egypt Controlled the Nile."

[104] Werrell and Femia, *The Arab Spring and Climate Change*, 11.

[105] Tamer Afifi, "The Environmental Root Causes Triggering Economic Migration: The Case of Egypt," in *Environment, Forced Migration and Social Vulnerability*, ed. by Tamer Afifi, and Jill Jäger, (Berlin, Germany: Springer, 2010), 198.

[106] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 43; Finaz, "Egypt Country Risk Brief," 2

[107] El-Ramady, El-Marsafawy, and Lewis, 50; Andrea Teti Et al., *The Arab Transformations Project*, 83.

polarization sharpening since their enactment.[108] The competition over land use for agriculture versus development is one that comes with no winners.

In order to combat the issue of limited agricultural area, Egypt imports a high volume of staple crops, such as wheat, from the global market. A common factor scholars look into as one of the drivers of the Arab Spring protests in Egypt was the shock to the global wheat market in 2010–2011 that had negative repercussions for Egyptians reliant on those imports.[109] Nations attempted to purchase available wheat which drove up prices and reduced global supply. The ensuring decreased supply caused widespread anger in Egypt despite the government spending 3% of GDP on wheat subsidies to cushion price effects.[110] Urban citizens were affected as they do not produce food, but even in the rural areas where agriculture is predominant, nearly 70% are poor and food insecure with farming unable to function as their main source of income or provide enough food for their families.[111] The possible solution of importing more food from abroad to counter the effects of the GERD seem unlikely with these recent negative effects on the food supply still within memory.

Aside from the direct competition for land use, farmers also must face the issue of lack of water availability for agricultural endeavors. Farming consumes 85% of the water total used by Egypt.[112] President El-Sisi has attempted to curtail this by imposing restrictions on water intensive crops like rice and bananas, but even with this the water demand is still high.[113] The Nile Delta has historically provided approximately 60% of the country's food production requirements, but with the increasing demands on the Nile they

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[108] Andrea Teti Et al., 83.

[109] Caitlin Werrell, Francesco Femia, and Troy Sternberg, "Did We See It Coming? State Fragility, Climate Vulnerability, and the Uprisings in Syria and Egypt," *The SAIS Review of International Affairs* 35, no. 1 (January 2015), 35, https://doi.org/10.1353/sais.2015.0002.

[110] Werrell and Femia, *The Arab Spring and Climate Change*, 9.

[111] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 51.

[112] Mohamed Mahmoud, "Egyptian Farmers Fear Drought, and Dam: 'Without the Nile There is No Life," *Middle East Eye*, January 13, 2017. https://www.middleeasteye.net/features/egyptian-farmers-fear-drought-and-dam-without-nile-there-no-life.

[113] Walsh, "For Thousands of Years, Egypt Controlled the Nile."

are not getting the necessary amount of water for their crops to produce.[114] The Delta is not alone in this as the southern province of Minya has also seen productivity decreases due to water shortages.[115] These shortages are expected to become worse as the increased population demands more water and the GERD reduces the supply. This scarcity has driven farmers to create illegal wells that further reduce the water supply downstream. They also cause soil erosion and farmers continue to grow water intensive crops for export.[116] Limited water supply is here to stay in Egypt.

The final agricultural problem is the overly saline soil. In order to provide for the ever-growing population, farmers crop the land two to three times per year and are aided in this endeavor by extensive irrigation.[117] This overexploitation of the land has led to soil waterlogging, drainage issues, and increased salinity that has reduced crop productivity.[118] Productivity reduction continues and gets worse the more the land is used. To further exacerbate the problem, the highly saline soil in the Nile Delta region is also made more saline by its proximity to the Mediterranean Sea and seawater intrusion.[119] Agricultural productivity is decreasing just as Egypt needs it to exponentially grow.

E. HISTORY OF GOVERNMENT INACTION AND POLICY FAILURES

The issues Egypt faces are difficult to combat, and yet doing anything would largely be an improvement over the actions Egyptian leaders have taken until recently. Climate change is beginning to affect the world more, but Egypt has faced it with inaction and avoidance. The topic was shunned in politics.[120] Further, the state does not see environmental induced migration as a concern and has instead focused on migration in

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[114] Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 4.

[115] Mahmoud, "Egyptian Farmers Fear Drought, and Dam."

[116] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 51.

[117] El-Ramady, El-Marsafawy, and Lewis, 41.

[118] Afifi, "The Environmental Root Causes Triggering Economic Migration," 199.

[119] "Dispute Over Water in the Nile Basin," Environment, Conflict, and Cooperation Factbook, 2009, 5, https://factbook.ecc-platform.org/fop/pdf/export?nid []=16563.

[120] Finaz, "Egypt Country Risk Brief," 1.

general from a policy perspective; neglecting important environmental factors.[121] By not focusing on these issues, the government is failing to adopt policies, like desalination and shifting agricultural policies, that could reduce the negative effects of climate change and mitigate the issues that are already in place. On top of the inaction, there is strong evidence that Egypt has severely mismanaged their water resources. This has led to water and food insecurities along with environmental threats as distribution networks fail to reach all citizens.[122] Even when actions are taken, the rampant corruption in the political system makes any proposed reforms unlikely to have the desired benefits.[123]

Unequal water distribution is one mismanagement issue in Egypt. The wealthy are more likely to have reliable, clean water while the urban and rural poor face unstable water access. They often have to pay high prices to private suppliers merely to get low quality water.[124] This unequal distribution has led to insecurity and shortages, with those already in the most precarious situations facing the negative effects.[125] Previously, after the privatization of water supplies in the early 2000s, protests sprouted up as people faced even worse conditions in water access.[126] With water availability expected to decrease, the competition over limited resources is likely to increase as citizens try to provide for their basic needs. Tensions could arise along socioeconomic lines as the lower classes are unable to meet these base requirements.[127] Governments can address these issues, but it requires proactive work and planning, planning that is not happening in Egypt.

Inaction is a common reaction to the effects of climate change, but Egypt also has pursued policies to counter their demographic and agricultural challenges; policies that

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[121] Afifi, "The Environmental Root Causes Triggering Economic Migration," 206.

[122] Werrell, Femia, and Sternberg, "Did We See It Coming?," 42.

[123] Lydia Assouad, "*Inequality and its Discontents in the Middle East*," Carnegie Middle East Center," (March 2020), 6, https://carnegie-mec.org/2020/03/12/inequality-and-its-discontents-in-middle-east-pub-81266.

[124] Greenwood, "Water Insecurity, Climate Change and Governance in the Arab World," 154.

[125] Finaz, "Egypt Country Risk Brief," 1.

[126] Andrea Teti Et al., *The Arab Transformations Project*, 35.

[127] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 78.

further exacerbate water scarcity in the nation. As previous agricultural land is encroached upon for urban development, the government has tried to promote agricultural expansion into the desert.[128] This expansion into the desert will require even more water than their overburdened system can handle. Crop productivity is decreasing in traditional farmland and expanding into an arid desert is unlikely to provide much benefit. President El-Sisi is also building a new administrative capital in the desert outside of Cairo that will require additional water servicing.[129] Expanding into desert areas for agriculture and urban development are policies the government is pursuing, but this fails to account for the increased water demand these policies will engender.

There have also been resettlement efforts with citizens moving to the Sinai Peninsula to decrease the demand on services in Cairo, but this has faced challenges of its own. The newcomers have been at odds with the Bedouin that inhabit the area. Issues over land rights, access to services, and natural resource management have all come to the fore as the newcomers are benefitting at the expense of the previous inhabitants.[130] In a nation that is largely desert, options for expansion are all problematic, from a water management standpoint.

Finally, the Aswan High Dam has created issues for Egypt while also providing necessary power generation. Finished in 1965, it was intended to release Nile water year round instead of just the summer flood season, but Lake Nasser loses between 12% and 14% of its water from evaporation and seepage each year.[131] This dam also prevents sediment from reaching the Nile Delta, which stops coastal replenishment as climate change is making this erosion worse.[132] Not all Egyptian policies are bad, though, as President El-Sisi has begun to take active measures to address the water supply needs for

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[128] Institute for Strategic Studies, *Climate Change, Violence and Young People*, 8.

[129] Walsh, "For Thousands of Years, Egypt Controlled the Nile."

[130] Oliver Walton, "Conflict, Exclusions, and Livelihoods in the Sinai Region of Egypt," Government and Social Development Resource Centre, Last Modified September 20, 2012, http://gsdrc.org/docs/open/hdq834.pdf,

[131] Stanley and Clemente, "Increased Land Subsistence and Sea-Level Rise are Submerging Egypt's Nile Delta Coastal Margin," 9.

[132] Stanley and Clemente, 9.

Egypt. The government has begun to build desalination plants along the Red Sea and Mediterranean coast. These facilities provide additional water while preventing the water loss and inefficiencies inherent in transferring water from the Nile to periphery areas.[133] This is part of a 20 year water management scheme with plans to spend over 50 billion USD on desalination plants and more efficient irrigation schemes.[134]

To sum up, the underlying water issues in Egypt are many, but some policies are being undertaken to address them. However, the concerns are that this may be too little and too late.

F. CLIMATE CHANGE EFFECTS

Egypt is particularly vulnerable to climate change with their dependence on the Nile, large agricultural base, and long coastline susceptible to sea level rise,. Indeed, the United Nations Intergovernmental Panel on Climate Change (IPCC) lists the Nile Delta as one of the most vulnerable areas on Earth for climate change.[135] As a vulnerable and poorly governed state, Egypt is likely to face complex and difficult problems associated with climate change. The less than perfect political environment makes mitigation and adaptation measures more difficult to pursue.[136] The primary climate change challenges facing Egypt are sea level rise, decreased and unpredictable Nile flow, and desert reclamation and expansion.

The most pressing climate change effect in Egypt, and the reason behind the IPCC's vulnerability assessment, is sea level rise that causes coastal erosion and increases soil salinity in the Delta. This densely populated area is less than two meters above sea level and is protected by a coastal sand belt that has been eroding at an accelerated rate because

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[133] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 77.

[134] Kieran Cooke, "Water Crisis Looms for Egypt as Ethiopia's Nile Mega-Dam Nears Completion," *Middle East Eye*, December 28, 2018, https://www.middleeasteye.net/news/water-crisis-looms-egypt-ethiopias-nile-mega-dam-nears-completion.

[135] Institute for Strategic Studies, *Climate Change, Violence and Young People*, 8.

[136] Institute for Strategic Studies, 2.

of the Aswan Dam.[137] This can be countered somewhat with dikes, but that will only curtail the worst of the flooding while increasing groundwater salination and spoiling fertile agricultural land.[138] Projected sea level rise in the area could reach 10% to 12% of the low lying basin area.[139] Theoretical future problems are one thing, but Egypt is facing current issues from sea level rise in the Mediterranean. Alexandria, the second most populous city in Egypt, has seen an increase in flooding with serious floods in 2015, 2017, and 2018 resulting in millions of dollars in lost revenue.[140] Temperatures have also been rising with the four hottest years on record occurring since 2000. Temperature increases expand the Mediterranean and also makes crops less productive and require more water.[141] These increases also intensify the evaporation of water supplies and Alexandria is increasingly forced to deplete its underground aquifers, which in turn allows seawater intrusion.[142] The problems are compounding and only getting worse.

It is not just the climate in Egypt that is important for their water supply but the source areas for the Nile River too.[143] The Ethiopian Highlands provide nearly 86% of the total water for the Nile and this is seasonally driven as most of the rain comes from highly variable, monsoon driven rains.[144] Increasingly common severe weather events in the Indian Ocean basin make droughts and extreme monsoon seasons become more likely.[145] Excess rain could be beneficial to Egypt, but it also poses the risk of increased flooding

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[137] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 83.

[138] Walsh, "For Thousands of Years, Egypt Controlled the Nile."

[139] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 52.

[140] Kieran Cooke, "Sinking Cities: How Climate Change is Ravaging the Middle East," *Middle East Eye*, November 23, 2018, https://www.middleeasteye.net/news/sinking-cities-how-climate-change-ravaging-middle-east.

[141] El-Ramady, El-Marsafawy, and Lewis, "Sustainable Agriculture and Climate Change in Egypt," 64.

[142] Cooke, "Sinking Cities."

[143] Ethan Coffel Et al., "Future Hot and Dry Years Worsen Nile Basin Water Scarcity," 975.

[144] ECC Factbook, "Dispute Over Water in the Nile Basin," 3.

[145] Daisy Dunne, "Are the 2019–20 Locust Swarms Linked to Climate Change?," Carbon Brief, last modified March 10, 2020, https://www.carbonbrief.org/qa-are-the-2019-20-locust-swarms-linked-to-climate-change.

into populated areas that the Aswan High Dam would be unable to regulate. Droughts pose obvious challenges. Beyond strategic competition over the GERD, Egypt is reliant upon the rain seasons that occur in upstream nations.

The final climate change effect on Egypt is the spread of the Western Desert that makes up almost a third of Egypt. President El-Sisi has attempted to expand agriculture and development into the desert, but the dunes are pushing back.[146] Dunes are advancing between 7.5 and 9.1 meters per year towards both newly established settlements and traditional oases because of extreme drought and lack of vegetation in the desert.[147] Encroachment on new territory is bad enough, but the desert is also gaining ground on the western side of the Nile valley.[148] As conditions become hotter and dryer in Egypt, the spread of the desert becomes easier and more of a negative factor that the government has to face. Climate change effects are present in Egypt now and are likely to worsen going into the future.

G. SO, IS MIGRATION PRESENT?

Climate change presents myriad challenges in Egypt, alongside multiple underlying domestic concerns, and the literature would tend to presume that migration would be present as a coping method. Despite this, internal migration rates in Egypt are low; an estimated 8% with the world average being 15%.[149] There are many proposed reasons for this, including that less-educated citizens are unable to gain employment if they migrate, labor is tied up in agriculture that they can not leave, rural poor produce food that helps to offset soaring food prices they would face in the city, family support networks help enough

146 Afifi, "The Environmental Root Causes Triggering Economic Migration," 204.

147 Mohamed E. Hereher, "Sand Movement Patterns in the Western Desert of Egypt: An Environmental Concern," *Environmental Earth Science* 59 (February 2010): 1126, https://doi.org/10.1007/sl126665-009-0102-9.

148 Hereher, "Sand Movement Patterns in the Western Desert of Egypt," 1120.

149 Santiago Herrera and Karim Badr, "Internal Migration in Egypt: Levels, Determinants, Wages, and Likelihood of Employment" (working paper, The World Bank, 2012), 5, https://openknowledge.worldbank.org/handle/10986/12014 . One caveat to this data is that internal migration is particularly difficult to accurately assess in Egypt as the government has purposefully neglected to collect data in order to prevent tensions from rising amongst its citizenry at their inability to provide necessary services to new arrivals. Afifi, "The Environmental Root Causes Triggering Economic Migration," 201.

to survive in the home area, cities lack affordable housing, and the general inability to fund migration unless a job is secured beforehand.[150] When the risks of migration are high and the situation at home is livable, Egyptians have tended to stay in place. Older generations also view leaving the land to look for work in cities as shameful, but the younger generation are open to it only if they are able to avoid migration's challenges.[151] Rich Egyptians have been successful in emigrating to North America, Europe, and Australia but for average Egyptians, the only option is to remain and endure inflation, unemployment, and increased environmental risks.[152] This section will examine Egyptian migration in three levels: internal movement, emigration, and the additional flow of refugees in the country.

1. Internal Migration

Internal migration data is difficult to accurately ascertain due to population density, the nature of circular and seasonal migration, and government inattention to the issue.[153] However, scholars have been able to piece together data in order to generate an understanding of the nature of migration in Egypt. Perhaps the most salient data is based on looking at the annual percentage of population residing in urban areas. A growing population that underwent significant migration would have an increasing rate of urbanization as people moved to urban areas, but Egypt has seen a less than 0.5% change in urban population total since 1980.[154] Of the small amount of internal migration present, it is primarily urban to urban, with rural to urban the next highest total.[155] Opportunities and areas to move to are limited as overpopulation and unemployment are ever-present challenges because of the extreme population density in Egypt.

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[150] Herrera and Badr, "Internal Migration in Egypt," 6 and 27.

[151] Mahmoud, "Egyptian Farmers Fear Drought, and Dam."

[152] Tsourapas, *Politics of Migration in Modern Egypt*, 202.

[153] UNESCO, Global Education Monitoring Report 2019 - Arab States - *Migration, Displacement, and Education: Building Bridges, Not Walls*, Paris, UNESCO, 19–20.

[154] UNESCO, 17.

[155] UNESCO, 18.

The internal migration that does occur in Egypt is generally directed towards the highly-populated Cairo area and canal governates.[156] Approximately 61% of migrants in cities come from other urban areas and the peak movement period for Egyptians is from 20–25 years old.[157] Those Egyptians that do move from rural areas tend to be more educated and earn higher wages than other workers in gaining communities.[158] Despite this, the severe overpopulation leads to residential segregation and migrants tend to be forced into inadequate slum housing.[159] New housing developments have been proposed in the past, but are often viewed as unrealistic due to the already high levels of population density and prevalence of informal settlements.[160] Not only are there challenges in making the decision to migrate, but for those that wish to the lack of available housing and services in cities further restrict its usefulness.

Many factors drive people to migrate, and the ranking of environmental push factors is difficult to assess. Some academics in Egypt that study migration claim that environmental degradation has no impact on migration and that the key drivers are unemployment and poverty.[161] However, others see environmental factors as the underlying reason that causes poverty amongst the rural population and that is why they migrate.[162] Factors that prevent environmental challenges from causing migration include land ownership and lack of financial means to move. Many rural Egyptians are unwilling to leave land that they own, even if it is unproductive. For those that have the desire to move to the city, the fiscal reality of selling their land and moving often prevents them from having a viable path to migrate.[163] Egyptians have still largely remained in place and not turned to migration as an adaptation technique or coping mechanism despite the

156 LO/FTF Council, *Labour Market Profile: Egypt 2016*, 12.

157 Herrera and Badr, "Internal Migration in Egypt," 9.

158 UNESCO, Global Education Monitoring Report 2019, 19; Herrera and Badr, "Internal Migration in Egypt," 13.

159 UNESCO, 21.

160 Tsourapas, *Politics of Migration in Modern Egypt*, 181.

161 Afifi, "The Environmental Root Causes Triggering Economic Migration," 203.

162 Afifi, 205.

163 Afifi, 205.

severity of the climate change threat working in conjunction with other systemic challenges.

2. Emigration

Internal migration in Egypt may be low, but that is partly due to government policies that have allowed for nearly unencumbered ability to pursue temporary labor emigration. Egypt is the largest provider of migrant labor in the Middle East with over six million dispersed throughout the region and a further three million abroad in Europe, America, and Australia as of 2016.[164] This was not a purely natural process, but a policy developed by the Egyptian government to create a safety valve for excess labor and to prevent issues of overpopulation and unemployment from destabilizing the regime.[165] During the Nasser period, education was expanded and Egyptians were promised state sponsored jobs at the completion of their schooling.[166]Tthis policy created a surplus of educated workers and the government did not have the ability to employ all of them. The regime, from the 1970s onward, instituted a policy of unencumbered emigration to Middle Eastern nations that removed excess workers from the domestic market, provided remittances, and allowed for more effective control of the remaining citizenry.[167]

As part of this policy, Egypt abandoned efforts to keep track of emigration so they could overestimate the total to the citizenry to incentivize labor emigration. Meanwhile, they could also downplay the number to foreign leaders to prevent any insecurity arising from this mass flow of people.[168] This policy even reached the 1971 permanent constitution where emigration was broken down into permanent and temporary, with temporary workers being those working in neighboring Arab nations regardless of the

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164 Gerasimos Tsourapas, "Egypt: Migration and Diaspora Politics in an Emerging Transit Country," *Migration Policy Institute*, August 8, 2018, 1, https://www.migrationpolicy.org/article/egypt-migration-and-diaspora-politics-emerging-transit-country.

165 Tsourapas, 6.

166 Tsourapas, *Politics of Migration in Modern Egypt*, 101.

167 Tsourapas, 18.

168 Tsourapas, 96.

duration of their stay.[169] With Gulf Cooperation Council (GCC) nations having the world's highest immigration rates, Egypt was able to supply this necessary labor while preventing issues from arising domestically.[170]

An important part of this program was the continued transmission of remittances back to Egypt. Egypt receives the largest amount of remittances in the region with 20 billion USD being sent back in 2017.[171] This serves as a key source of income and, as money transfers can be done unofficially, this total may be even higher than the official numbers.[172] The ability of the state to export their labor, remove the need to provide services to portions of their citizenry, alleviate urban overpopulation, and gain remittances in the process made this policy a success. With remittances making up at least 6% of GDP, this policy was effective on multiple levels.[173]

The policy has been facing strain in recent years, despite its temporary success. There has been a steady fall in the recruitment of Egyptian labor as GCC nations have increasingly turned to South Asian migrant labor.[174] The fall of Gaddafi in Libya and the ensuing instability also caused a mass influx of return migrants to Egypt and overwhelmed their capability to support them.[175] This return of labor has further burdened the domestic job market and made the economic situation more dire as some young Egyptians are now attempting to reach Europe through unofficial paths across the Mediterranean.[176] Wealthy Egyptians are able to legally migrate to Western nations, and there has been an increase in

169 Gerasimos Tsourapas, "Why Do States Develop Multi-Tier Emigrant Policies? Evidence from Egypt," *Journal of Ethnic and Migration Studies* 41, no. 13 (November 2015): 2198, https://doi.org/10.1080/1369183X.2015.1049940.

170 UNESCO, Global Education Monitoring Report 2019, 25.

171 UNESCO, 28–29.

172 Tsourapas, "Egypt: Migration and Diaspora Politics," 3.

173 LO/FTF Council, *Labour Market Profile: Egypt 2016*, 12.

174 Tsourapas, "Egypt: Migration and Diaspora Politics," 4.

175 Tsourapas, 12–13.

176 Tsourapas, 12–13.

international mobility for this group since 2011, but this is not an option for most Egyptians.[177]

Egypt is now facing more domestic tension as regional migration opportunities have diminished,. According to a Gallup Potential Net Migration Index poll, if all Egyptian adults who wanted to emigrate could do so, the population of Egypt would decline by 20–30%[178] Even if they could leave, however, Egypt would still face environmental challenges that make the underlying conditions worse.

3. Refugee and Other Flows

Separately from the movement of Egyptians, international migration and refugee flows through Egypt add complications to the already troubled nation. Egypt is a source, destination, and transit country for migration with over 250,000 refugees currently residing in the overpopulated city of Cairo and in urban areas of the Nile Basin.[179] It is traditionally more of a transit nation with refugees intending to continue across the Mediterranean to Europe, but refugees are increasingly using Egypt as a final destination due to their inability to travel further.[180] Egypt has attempted to make it hard on refugees to force their continued transit through police violence, irregular detentions and killings, and nationalist xenophobia that acts as a palliative for domestic issues but this has not stopped the trend.[181] As refugees live in urban areas and not camps, they further overload the national safety net shared with Egyptian citizens. Refugee communities compete with Egyptians in the informal labor market that they have been increasingly forced to turn to as a result of the

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[177] Andrea Teti Et al., *The Arab Transformations Project*, 98.

[178] UNESCO, Global Education Monitoring Report 2019, 28.

[179] "Egypt: February 2020," United Nations High Commission on Refugees, 2020, http://reporting.unhcr.org/sites/default/files/UNHCR%20Egypt%20Fact%20Sheet%20-%20February%202020_0.pdf.

[180] LO/FTF Council, *Labour Market Profile: Egypt 2016*, 12.

[181] Anna Louise Strachan, "Conflict Analysis of Egypt," K4D, last modified February 27, 2017, 8–9; United Nations High Commission on Refugees, *Egypt Response Plan for Refugees and Asylum-Seekers From Sub-Saharan Africa, Iraq, & Yemen 2019*. (6th of October City, Egypt: UNHCR, 2019), 18; Andrea Teti Et al., *The Arab Transformations Project*, 58.

failures of the economy.[182] The United Nations High Commission on Refugees provides unconditional cash assistance to these refugees, with funds ranging from EGP 600–1,800 that covers approximately 30% of basic needs.[183] This is another source of tension as Egyptians are not given this assistance and their government is unable to provide for the booming population.

4. Does That Migration Create Conflict?

In the leadup and aftermath of the Arab Spring, there were widespread protests from farmers that were facing water scarcity, across the Nile Delta and through the Upper Nile region.[184] The states of Ismailia, Fayoum, Minya, Dakahlia, and Sharqia saw farmers gathering to protest water scarcity that prevented necessary irrigation, forcing some farmers to turn to sewage water and others to lose their limited cultivatable land.[185] Additionally, farmers were protesting against the ability of the wealthy and politically connected to get water while they could not get what they needed. These protests' intensity has declined, but they continue today, as lack of water access and scarcity have not gone away. Rural leaders must continue to settle disputes between farmers as they compete over irrigation access.[186]

These protests were not caused by migration, since Egypt experiences very little urban-to-rural or rural-to-rural migration. However, as long as demands are unmet and protests continue, people could make the decision to migrate in order to gain more reliable water access or an alternative livelihood. This movement could add more tension in the gaining communities, which are likely to be urban areas, if historical internal migration patterns continue.

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[182] United Nations High Commission on Refugees, *Egypt Response Plan*, 37 and 43.

[183] United Nations High Commission on Refugees, 37.

[184] "Growing Protests Over Water Shortages," *The New Humanitarian*, July 27, 2010, http://www.thenewhumanitarian.org/news/2010/07/27/growing-protests-over-water-shortages.

[185] "Growing Protests Over Water Shortages."

[186] Mahmoud, "Egyptian Farmers Fear Drought, and Dam."

However, so far, environmental migrants do not seem to be contributing much to conflict in Egypt's urban areas. Urban violence is an issue in Egypt, but it is not strongly linked to environmentally-induced migration, partly because there is so little internal migration—let alone internal, environmentally-induced migration—in Egypt.[187] Urban conflicts are instead primarily caused by poor governance, social inequality, and ineffective institutions.[188] Over the past decade there has been a decrease in confidence in law enforcement and political classes in Egypt with increasing mobilization of broad sectors of the population against the government.[189]

Some academics view climate change as an important variable in the lead up to the Arab Spring protests and ensuing government overthrow in Egypt. They argue that climate change helped to raise the cost of wheat prices globally due to production shortfalls, which then trickled down to increase the cost of staples like bread, despite subsidies.[190] This dynamic may have contributed to the revolution. However, it did not contribute through the pathway of migration, as the rise in food prices did not cause migration prior to the protests and environmental migrants did not play a part in the revolution.

H. CONCLUDING THOUGHTS

Water scarcity and climate change are challenges that Egypt must face, but they are not currently causing much internal migration. Without environmental issues causing migration, there can be no conflict caused as a result. However, this does not mean that environmental conflict potential is absent in Egypt. Climate change can put stress on society through decreased crop yields and lower water supplies that create scarcity, competition, and conflict without the intervening variable of migration.

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187 Finaz, "Egypt Country Risk Brief," 3.

188 Institute for Strategic Studies, *Climate Change, Violence and Young People*, 8.

189 Andrea Teti Et al., *The Arab Transformations Project. Political and Social Transformations in Egypt: Work Package 7*, University of Aberdeen, 2015, 23.

190 Werrell, Femia, and Sternberg, "Did We See It Coming?," 35.

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III. THE CASE OF SUDAN

> "Almost invariably, we discuss Darfur in a convenient military and political short-hand – an ethnic conflict pitting Arab militias against black rebels and farmers. Look to its roots, though, and you discover a more complex dynamic. Amid the diverse social and political causes, the Darfur conflict began as an ecological crisis, arising at least in part from climate change."
>
> —Former U.N. Secretary General Ban Ki-moon[191]

A. INTRODUCTION AND CHAPTER OVERVIEW

Sudan faces drastically different conditions internally from its northern neighbor Egypt. It has political, economic, social, ethnic, and environmental stressors. The people of Sudan have suffered from many problems in recent years with interlinked issues feeding periods of conflict, government incompetence and neglect, and environmental degradation. Despite international attention given to Sudan for the role of climate change in causing the conflict in Darfur and the continued focus on Sudan as a case study for environmental security analysis, this chapter sees climate change as just one of many issues facing the nation and conflict itself acting as a larger driver of population movement than environmental stress, scarcity, or climate change.

This chapter begins with the current effects of climate change in Sudan to understand the environmental issues facing citizens and the state. Next, I analyze the existing types of migration and displacement to determine how climate change factors into this movement of people. Then, I look at conflict present in society from the second civil war, beginning in 1983, through the present day to understand what caused the fighting and whether migration from environmental scarcity drives this conflict. The analysis concludes that despite the many claims about the primacy of climate change causing migration and conflict in Sudan, government exploitation and negligence of peripheral

[191] Oli Brown and Alec Crawford, *Climate Change and Security in Africa: A Study for the Nordic-African Foreign Ministers Meeting, 2009*, (Winnipeg, CA: International Institute for Sustainable Development, 2009), 5.

regions are the more concrete causes of conflict and that this has also made environmental degradation and the effects of climate change worse in Sudan.

B. CLIMATE CHANGE ISSUES AND ENVIRONMENTAL CHALLENGES

Sudan faces many challenges from climate change and these are only made worse by reliance on rainfed agriculture and underdeveloped state infrastructure. This creates structural food and water insecurity, particularly in the peripheral states.[192] The most severe and pressing impacts of climate change in Sudan are increased rainfall variance, more severe and frequent droughts, and desertification. There are other less severe effects that will be addressed, namely less frequent Nile flooding, increased pest spread, and sea level rise in the Red Sea. With extreme regional climate variance, Sudan will be affected in different ways from climate change as the north is already desert, the south is rainy, and the center has four distinct season that encompass severe heat and dryness to a full rainy season.[193]

Sudan is one of the driest, but most variable, countries in Africa in regards to rainfall; extremes in either direction are more common than average years.[194] This is detrimental to the nation as it relies so heavily on rain for its farming and food security, particularly in rural areas where more than 65% of the population lives.[195] The dangers of minimal rain are straightforward, but the complications that heavy rain brings are often not viewed with equal primacy. Above average rains can cause flash floods and soil waterlogging, destroy crops, and cause erosion particularly on large-scale agricultural

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[192] Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC,* 30; Sumaya Ahmed Zakieldeen, "Adaptation to Climate Change: A Vulnerability Assessment for Sudan," *International Institute for Environment and Development* 142 (November 2009): 5, www.jstor.org/stable/resrep01362.

[193] Republic of the Sudan Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the United Nations Framework Convention on Climate Change*, (Khartoum, Sudan: Ministry of Environment, Forestry and Physical Development, 2013), 1, https://unfccc.int/sites/default/files/resource/Sudan-2NC-Final.pdf.

[194] Zakieldeen, "Adaptation to Climate Change," 4.

[195] Mutasim Bashir Nimir and Ismail Elgizouli, "Climate Change Adaptation and Decision Making in the Sudan," World Resources Institute, Accessed 10 July, 2020, https://www.wri.org/our-work/project/world-resources-report/climate-change-adaptation-and-decision-making-sudan.

schemes.[196] Additionally, Selby and Hoffman's 2014 analysis of Sudan concluded that water abundance is a more important factor than scarcity in driving conflict.[197] In eastern Sudan the rainfall is becoming more intense and variable with only 70 ml of rain in 2015 followed by over 600 ml in 2016.[198] Country-wide the nation is facing unpredictable rain, late harvests, and severe crop losses with 2019 seeing prolonged dry spells followed by intense rain in August.[199] This delayed crop production and benefitted late season crops, but also helped to spread plant diseases, weeds, and pests.[200] Climate models based on the national level predict higher rainfall going forward, but this can mask the increased frequency of droughts and flash floods that exist alongside the regional differences.[201] As a nation so reliant upon consistent rainfall, Sudan faces challenges from the variable effect climate change brings.

At the same time rainfall is becoming increasingly erratic, instances of drought have been increasing across Sudan and the surrounding Horn of Africa.[202] From 1972 until 2008 there were 16 droughts in Sudan, but from 2005 onward drought in the Horn has doubled from once every six years to once every three years.[203] These recurrent droughts have become the norm in Sudan, with Darfur, Kordofan, and Gadarif being the most affected regions and Darfur facing the additional challenge of an overall 30% decrease in rain over

196 Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, (Uppsala, Sweden: The Nordic Africa Institute, 2014), 58.

197 Jan Selby and Clemens Hoffmann, "Beyond Scarcity: Rethinking Water, Climate Change and Conflict in the Sudans," *Global Environmental Change* 29 (November 2014): 367, http://dx.doi.org/10.1016/j.gloenvcha.2014.01.008.

198 Hannah McNeish, "Farmers in Sudan Battle Climate Change and Hunger as Desert Creeps Closer," *The Guardian*, December 19, 2016. https://www.theguardian.com/global-development/2016/dec/19/sudan-faremers-battle-climate-change-hunger-desertification.

199 John Vidal, "Sudan – Battling the Twin Forces of Civil War and Climate Change." *The Guardian*, 21 November 2011. https://www.theguardian.com/environment/2011/nov/21/sudan-civil-war-climate-change.

200 FAO, *2019 FAO Crop and Food Supply Assessment Mission to the Sudan*, 18.

201 Verhoeven, "Climate Change, Conflict and Development in Sudan," 703.

202 Florian Krampe et al., "Water Security and Governance in the Horn of Africa," 9.

203 Karen Jacobsen, Internal *Displacement to Urban Areas: Sudan Case*. (Somerville, Massachusetts: Tufts University), 17; Gebremedhin Haile et al., "Droughts in East Africa: Causes, Impacts, and Resilience," Earth Science Reviews no. 193 (2019): 147, https://doi.org/10.1016/j.earscirev.2019.04.015.

the past three decades.[204] As droughts have become more frequent, their impacts are aggravated by deforestation, land degradation, and excessive drain on the water supply resulting from expanded agricultural schemes.[205] This had made the pain from droughts last longer and effects can carry on even longer when droughts are followed by flash floods, which are frequent occurrences in the transition to the rainy season.[206] Temperatures are also rising with an average increase of .2-.4 degrees Celsius per decade since the 1960s. Combined with droughts and increased water demands, this has led to evaporation and the loss of almost half of the White Nile in southern Sudan.[207]

Despite the overall abundance of water in the nation, notwithstanding seasonal variability, the state has been unable to provide for citizens as only 68% of the population has access to water services and farms continue to face deteriorating crop returns while the state fails to use its full annual allotment of water from the Nile.[208] Unless crop production develops to account for the severity of drought, Sudan risks becoming trapped in a cycle of insecurity. This cycle could begin with the state being unable to provide enough food, food prices increase, farmers are unemployed and migrate to cities, and the government has their resources stretched even further while being unable to account for rising demand.[209]

Coinciding with the regional decreases in rainfall and increased frequency of droughts, Sudan has seen spreading desertification and the loss of agricultural and range land from climate change. From the 1930s there has been a continued southward shift of

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[204] Abbas Sharaky, "Oil, Water, Minerals, and the Crisis in Darfur, Sudan," Institute of African Research and Studies, Cairo University, 42 and 46, https://www.academia.edu/11052085/OIL_WATER_MINERALS_AND_THE_CRISIS_IN_DARFUR_SUDAN; Zakieldeen, "Adaptation to Climate Change," 11.

[205] Haile et al., "Droughts in East Africa," 146.

[206] Haile et al., 147.

[207] Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, 30; *Sudan Post-Conflict Environmental Assessment*, 7.

[208] *2019 Humanitarian Response Plan: Sudan*. UNOCHA, 2019, 38; Gebremedhin Haile et al., "Droughts in East Africa: Causes, Impacts, and Resilience," Earth Science Reviews no. 193 (2019): 151. https://doi.org/10.1016/j.earscirev.2019.04.015; Selby and Clemens Hoffmann, "Beyond Scarcity," 363.

[209] Haile et al., "Droughts in East Africa," 151.

the semi-desert/desert northern border and this expansion has threatened pastoral and agricultural areas while also displacing people during droughts.[210] In the north of Darfur, millions of hectares of land that had previously been semi-arid grazing land have become desert. Rangelands have also seen reduced variety and quantity of plants that are suitable for grazing.[211] Desertification has not just affected Darfur, but also is present in Kordofan, Kassala, and Khartoum states.[212] As grazing land diminishes from climate change and agricultural land expands because of government policies, water reserves have dwindled, land access has risen as a contentious issue, and food insecurity has spread; all factors that have caused an increase in citizen frustration.[213]

Rain variance, flooding, and desertification may be the main challenges facing Sudan from climate change, but they are not the only ones. Sudan faces two types of flood challenges; torrential rain in the Ethiopian highlands that causes the Nile to overflow and locally heavy rainfall in the rainy season that causes flash floods.[214] These are separate from the rising and falling of the Nile that allows silt to deposit on the farmland along the river and are more extensive issues. The annual Nile floods of this type have declined due to heat, evaporation, and upstream dam construction, but the more severe floods have slightly increased as there have been four severe floods since 1977, including one in September of 2020, with only two in the previous 100 years.[215] This flooding has also

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[210] *Sudan Post-Conflict Environmental Assessment*, 7.

[211] Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, 63–65; Ali Abdel Kareim Hameed et al., *Literature Assessment on Drought in Sudan*, ISSN 1503–0601, (Oslo, Norway: Drylands Coordination Group, 2011), 3, https://www.utviklingsfondet.no/dcg/assets/documents/Publications/1098-dcg_report_69.pdf.

[212] Anna Strachan, R*apid Fragility and Migration Assessment for Sudan*. (Birmingham, UK: GSDRC, 2016), 4. http://www.gsdrc.org/wp-content/uploads/2016/02/Fragility_Migration_Sudan.pdf.

[213] Williams, *Shifting Borders*, 20; Schwarzstein, "One of Africa's Most Fertile Lands is Struggling to Feed Its Own People."

[214] Nimir and Ismail Elgizouli, "Climate Change Adaptation and Decision Making in the Sudan."

[215] McNeish, "Farmers in Sudan Battle Climate Change and Hunger as Desert Creeps Closer;" Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC*, 2; Max Bearak, "Deadly, Worst-in-a-Century Floods Inundate Sudan," *The Washington Post*, Sep 16, 2020, https://www.washingtonpost.com/graphics/world/2020/09/16/sudan-floods-nile-rivers/.

contributed to riverbank erosion that puts a further strain on farmers.[216] Separate from flooding the large mechanized agricultural schemes often resort to boreholes to augment their water supply, but with more doing this the underground supply runs low and becomes excessively saline later in the dry season.[217]

These issues with farming and floods have forced many farmers to shift to shorter cycle crops and plant later in the season.[218] This in turn has led to higher pest, disease, and weed problems that make crops less productive and are only made worse by the high cost of pesticides and herbicides.[219] All of east Africa has been facing challenges in 2019 and 2020 from the spread of desert locusts, with optimal conditions created for their growth and spread from an excessively heavy rainy season. Challenges like this are only likely to continue as the climate becomes more variable and unpredictable.

Finally, the prospect of sea level rise poses challenges for Sudan as one of its few large cities, and an important shipping center, lies along the coast of the Red Sea. Port Sudan is a vital outlet that connects the nation to the international market and their trade with Gulf countries, but much of the infrastructure is at sea level. As the government invests more in the business sector and migration increases for job opportunities in the city, it only makes it more vulnerable to sea level rise.[220] The current level of rise has been slow, 10–20 cm over the last 100 years, but it is still occurring and a concern for the government that relies on the port.[221]

C. MIGRATION AND DISPLACEMENT

This section analyzes what causes people to move in Sudan and where they go. There are many factors that cause people to migrate or become displaced in Sudan with

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216 *Sudan Post-Conflict Environmental Assessment*, 7.

217 Ibrahim, "Rainwater Harvesting for Urban Areas," 2733.

218 FAO, *2019 FAO Crop and Food Supply Assessment Mission to the Sudan*, 35.

219 FAO, 2 and 27.

220 Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC,* 51.

221 Ministry of Environment, Forestry and Physical Development, 45–46.

conflict, government-induced displacement, government neglect, climate change, drought, seasonal migration, and refugee flows all accounting for the movement of over three million people, out of a national population of nearly 43 million, in 2019.[222] While nearly 2 million of the displaced live in camps in the Darfur states, the remaining third primarily move to cities.[223] Migration is concentrated in the small number of cities in Sudan, primarily Khartoum, Port Sudan, and Nyala, where the displaced face challenges in accessing basic services, livelihoods, and land.[224] Rural to urban migration has significantly increased urban poverty as the already limited government resources are overly strained.[225] The value of land has increased with more people in cities, and the urban poor are being pushed out to slums and informal housing. As Khartoum houses half of the urban population and sits on the confluence of rivers, these informal settlements are also at increased risk for flooding and further displacement.[226]

Sudan's conflicts, including its civil wars and regional disputes in Darfur and the Two Areas, have created a large population of internally displaced persons (IDPs). In the early 1990s, multiple IDP camps were created around Khartoum to house the displaced.[227] This policy shifted in the mid 1990s as the government claimed people were coming to the city just to profit off its generosity. It has since pushed IDPs into whatever housing they can find, often slums on the outskirts of the city.[228] In Darfur, urban populations have increased from 20% in 2003 to over 50% in 2017 due mostly to the constant fighting and displacement. IDPs also make up as much as a quarter to one third of the population in

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222 Williams, *Shifting Borders*, 33.

223 *Sudan Migration Profile: Study on Migration Routes in the East and Horn of Africa.* Maastricht Graduate School of Governance, 2017, 7.

224 Sara Pantuliano et al., *City Limits: Urbanisation and Vulnerability in Sudan Khartoum Case Study*. (London, U.K.: Humanitarian Policy Group, 2011), 1, https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6520.pdf.

225 Anna Strachan, R*apid Fragility and Migration Assessment for Sudan*. (Birmingham, UK: GSDRC, 2016), 2, http://www.gsdrc.org/wp-content/uploads/2016/02/Fragility_Migration_Sudan.pdf; Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, 74.

226 Pantuliano et al., *City Limits*, 2 and 12. The Nile flooding in September of 2020 displaced over 500,000 Sudanese citizens, principally from these slums and informal settlements.

227 Jacobsen, *Internal Displacement to Urban Areas*, 19.

228 Jacobsen, 20.

larger urban areas like Khartoum.[229] This population growth is almost entirely the result of those displaced by conflict as the percentage of people living in urban areas hardly changed between the 1993 and 2008 censuses, going only from 29% to 30%.[230] While many IDPs have moved to cities, there has also been a concurrent and much larger rise in the rural population that minimizes the influence of this rise in national percentages.

Population displacement from internal conflict continues and serves as the biggest push factor to cities with regular attacks in conflict areas still occurring,.[231] The government is partly responsible for the displacement of people through regional conflicts, but also displaces citizens as it takes land for agriculture and oil exploitation.[232] Many farmers have had to abandon their traditional livelihoods after having their land taken and move to cities that are already overburdened. Their only other option would be to work on the large agricultural scheme that had displaced them from their farms.[233] This dynamic, however, displaces far fewer citizens than violent conflicts.

After conflicts, droughts and climate change are the second most important push factor driving migration in Sudan. Historically, severe droughts have been a prime mover of people. In the 1970s and 80s there was an extended Sahel drought that left farmers and pastoralists with no other options but to migrate as their crops failed and the water supply became scarce.[234] During the second civil war (1983-2005), over 2 million people moved to Khartoum following severe reductions in agricultural productivity from drought coupled with the long-running civil war.[235] This movement of people was not just to Khartoum but

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229 *East Africa and the Horn in 2022,* 7; Jacobsen, *Internal Displacement to Urban Areas*, 8.

230 Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC,* 3.

231 Hassan, *Spilling Over*, 22; Pantuliano et al., *City Limits*, 2.

232 Jemera Rone et al., *Sudan, Oil, and Human Rights: Summary*, (Brussels, Belgium: Human Rights Watch, 2003), 1 and 3, https://www.hrw.org/reports/2003/sudan1103/8.htm.& Jacobsen, *Internal Displacement to Urban Areas*, 17.

233 Eljack, Ali, and Osman, "Irregular Ethiopian Immigrants and Urban Labour Market in Eastern Sudan," 65. Agricultural schemes are large scale farming businesses in Sudan.

234 Selby and Hoffmann, "Beyond Scarcity," 365.

235 Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, 54; Strachan, R*apid Fragility and Migration Assessment for Sudan,* 14.

also within peripheral states, like Darfur, where entire communities moved and contributed to long-term changes as people stayed in cities due to the deterioration of land quality.[236]

The subsistence farmers that dominate farming in Sudan are greatly susceptible to the effects of drought and often lack any alternative if they are unable to grow their own food. The lack of other options and the increased frequency of droughts has continued to cause the displacement of Sudanese farmers to cities where they seek different livelihoods, particularly during droughts and dry seasons. These events have been more localized and less severe than the droughts of the 70s and 80s with less migration occurring as a direct result.[237] Farmers have been able to change their crops to attempt to deal with dry seasons and avoid moving, while also diversifying their income through remittances and aid.[238] These fixes help with extended and harsher dry seasons, but a severe drought would still greatly impact farmers and pastoralists within Sudan and potentially cause them to migrate going forward. Estimates of increased drought frequency due to climate change will continue to pose risks that can cause migration into the future. As droughts worsen and the environment is more degraded, the displacement of people further damages the environment as cities expand and draw more on overtaxed water supplies.[239]

In addition to farmers that migrate permanently to urban areas, Sudan has many farmers that migrate temporarily during the dry season. As an example, the regional farming village of Butana in Gadarif sees its population diminish annually during dry seasons from 72,000 to only 12,000 as farmers leave to seek opportunities in the city as their land becomes unproductive.[240] Decreased crop efficiency and the increasing

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[236] Selby and Hoffmann, "Beyond Scarcity," 365; Hameed et al., *Literature Assessment on Drought in Sudan*, 13.

[237] Hameed et al., *Literature Assessment on Drought in Sudan*, 16.

[238] Selby and Hoffmann, "Beyond Scarcity," 365; FAO, *2019 FAO Crop and Food Supply Assessment Mission to the Sudan*, 10.

[239] "Climate Change – Only One Cause Among Many for Darfur Conflict," *The New Humanitarian*, June 28, 2007, https://www.thenewhumanitarian.org/news/2007/06/28-0; Ahmed et al., *Dryland Husbandry in the Sudan*, 54.

[240] McNeish, "Farmers in Sudan Battle Climate Change and Hunger as Desert Creeps Closer."

unpredictability of the rainy seasons creates additional push factors for those reliant on farming to move temporarily to cities and diversify their income.[241]

Another major movement of Sudanese citizens is driven by pastoralists. As a way of life, pastoralists seek pasturage in the south of the country during the dry season, typically November through April, while spending the rest of their time in the north. With climate change more strongly affecting Sudan, these movements are taking some pastoralists even further south into Kordofan where other seasonal migrants go. This has in turn raised issues over grazing and water rights.[242] Southern Kordofan is also a major destination for those displaced by drought and war so the influx of seasonal pastoralists adds to the tensions in the region.[243] The population influx into Kordofan has caused severe environmental degradation around major settlements and permanent water points that are used by the migrating groups and farmers. Local leaders are important in managing disputes in the area over these access issues but as pastoralists must go further to find viable pasturage, they will only come into further tension and conflict.[244] As pastoralists make up almost 10% of the population, this is a large addition to people migrating partly from climate effects.

The final piece involved in the movement of people in Sudan is refugees. While the IDPs make up a large part of movement, cross border flows from conflicts in South Sudan, Eritrea, the Central African Republic, and Syria make up over 1.1 million refugees in Sudan with over 70% living outside of camps.[245] Many of these people live in undeveloped areas along the border, but over 120,000 live in Khartoum and further exacerbate the problems of service provision and food and water security.[246] Sudan also serves as a transit country for refugees who are attempting to reach the Mediterranean coast and sail onwards to Europe. These transitory refugees add to the demands on services in cities while also

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241 Gray and Kevane, "Darfur: Rainfall and Conflict," 9.

242 Chavunduka and Bromley, "Climate, Carbon, Civil War and Flexible Boundaries," 910.

243 Chavunduka and Bromley, 908.

244 Muna Ahmed et al., *Dryland Husbandry in the Sudan*, 3.

245 *Sudan Country Refugee Response Plan 2020*, UNHCR, 5.

246 *Sudan Country Refugee Response Plan 2020*, 31–32.

competing for jobs in the informal labor market while in the country.[247] This flow of people adds to the tensions and potentials for conflict in Sudan as they join the millions more Sudanese citizens that are also moving inside the nation and reside in the overly populated urban areas where they draw on government services.

There is a large and diverse flow of migrants in Sudan and these millions of people face intermixed challenges that have forced them to move. Climate change plays a part, but it ties in to longer standing issues like underdevelopment, poor resource allocation, and conflict that make direct causality arguments difficult. Those that move in response to decreases in crop productivity or water shortages are not directly moving because of climate change. However, the severity of weather conditions and unpredictable rains make their already dire situations worse and aid in their decision to migrate. Conflict directly moves a larger percentage, by at least a two to one ratio, but instances of severe drought and flooding have been increasing in Sudan and are likely to become more frequent and severe as a result of climate change. This will continue to drive migration, even if the regional conflicts are able to end. These more environmental driven migrants are not fleeing to IDP camps like the displaced but are moving to urban centers like Khartoum and Port Sudan. This movement is creating an increased demand on services while expanding informal housing settlements on the edges of the cities. Even if the government expands service provision and develops the peripheral regions that are the primary sending areas of these migrants, environmental factors are likely to continue to act as a push factor in Sudan.

D. LARGE-SCALE INTERNAL CONFLICT

Political challenges teem in Sudan and the situation is only made worse by the existence of long-term internal conflict. Since its independence from Egypt, Sudan has been beset by conflict; two long running civil wars that led to the secession of South Sudan, the uprising in Darfur, insurgency in the Two Areas (South Kordofan and Blue Nile), as well as border disputes with Egypt and South Sudan for control of resource rich Abyei

[247] Ibtisam Eljack, Mutasim Ali, and Mohammed Osman, "Irregular Ethiopian Immigrants and Urban Labour Market in Eastern Sudan: The Experience of Sudanese Employers in Gadarif Locality," *Journal of Business Studies Quarterly* 8, no. 1 (September, 2016): 63. http://search.proquest.com/docview/1831706659/.

Triangle and the 14-mile area. The continuation of these conflicts has diverted resources away from longer-term concerns of environmental change, land degradation, and food security while displacing millions.[248]

There have been many explanations offered for the origins of these conflicts but, to put it mildly, they are complex and interconnected. A central cause of conflicts in Sudan is that its peripheral areas were underdeveloped by President Bashir as part of a policy where the Arab center and north of the country were privileged at their expense. These regions are both ethnically, religiously, and socially different than the ruling Arab elite in Khartoum and were exploited because of this and their rich natural resources.[249] This toxic combination of religious differences, ethnic complexity, socio-economic disparities, political disenfranchisement, and resource exploitation has fueled anger in the regions, which have risen up in revolt against the central government.[250] Adding the propensity for droughts in Sudan to the already poor water infrastructure, sources for grievance abound.[251]

The 2005 Comprehensive Peace Agreement (CPA) helped bring an end to the second civil war and allowed for South Sudan to gain its independence in 2011. Interestingly, while the CPA addressed many grievances the rebels had, water seemed to be a low priority relative to issues of borders, oil revenue sharing, and repatriation concerns.[252] Meanwhile, the conflict in Darfur remains unsettled and the secession brought about renewed conflict in the Two Areas, bordering the newly created South Sudan, as

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[248] Hameed et al., *Literature Assessment on Drought in Sudan*, 20.

[249] Dagne, *Sudan: The Crisis in Darfur*, 20–21; *Sudan Post-Conflict Environmental Assessment: Synthesis Report*, ISBN 978–92-807-270-9, (Nairobi, Kenya: United Nations Environment Programme, 2007), 6, https://postconflict.unep.ch/publications/UNEP_Sudan_synthesis_E.pdf; John Young, *Sudan Uprising: Popular Struggles, Elite Compromises, and Revolution Betrayed*, ISBN 978–2-940548-83-5, (Switzerland: Small Arms Survey, 2020), 12.

[250] El-Gizouli, *The Fall of al-Bashir*, 4; Dagne, *Sudan: The Crisis in Darfur*, 20–21; Harry Verhoeven, "Climate Change, Conflict and Development in Sudan: Global Neo-Malthusian Narratives and Local Power Struggles," *Development and Change* 42, no. 3 (May 1, 2011): 684, https://doi.org/10.1111/j.1467-7660.2011.01707.x

[251] Verhoeven, "Climate Change, Conflict and Development in Sudan," 685.

[252] Selby and Hoffmann, "Beyond Scarcity," 364.

deep-seated economic and political disparities remained unresolved in the agreement.[253] The underlying issues of political and social marginalization were not addressed and new border regions were created that faced exploitation by the center, despite local elites calling for more control over state resources along with increased regional development.[254]

Blue Nile and South Kordofan are both rich with grazing and agricultural land, Nile water, and mineral resources. As the government sought to control those resources while punishing citizens that had supported the southern rebels, conflict erupted and has remained active until today. These conflicts are therefore driven more by resource abundance and government exploitation than migration or resource scarcity.[255] This conflict has also taken on an ethnic tinge as the central government would hire local militias as proxies and those militias were often rival ethnic groups.[256] President Bashir also encouraged other ethnic groups to settle in the Two Areas in order to pressure the local population and gain access to the resources through a more friendly demographic.[257]

Rather than causing these conflicts, population movements have been a result of fighting and food insecurities have resulted from the citizens being displaced from their land. Continuation of violence has made farming difficult as people are repeatedly driven off their land and unable to plant on time or harvest when crops are ready, with some citizens migrating to urban areas to avoid the conflict and access services.[258] This issue has been exacerbated as droughts, floods, and the rainy season have intermingled with fighting to make farming an increasingly difficult endeavor in the region, with food scarcity resulting.[259]

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253 Adam O'Brien, *Sudan's Election Paradox*, (Washington, DC: The Enough Project, 2009), 2, https://enoughproject.org/files/sudan_elections.pdf.

254 Strachan, R*apid Fragility and Migration Assessment for Sudan*, 9; Hassan, *Spilling Over*, 16.

255 Khalid Ammar Hassan, *Spilling Over: Conflict Dynamics in and Around Sudan's Blue Nile State, 2015–2019*, ISBN 978–2-940548-80-4, (Switzerland: Small Arms Survey, 2020), 12, http://www.smallarmssurveysudan.org/fileadmin/docs/reports/HSBA-Report-Sudan-Blue-Nile.pdf.

256 Hassan, 9.

257 Hassan, 15.

258 *Sudan's Spreading Conflict (I)*, I and 27–29.

259 Hassan, *Spilling Over*, 44.

Separately, another regional conflict has raged within Sudan as Darfur has been fighting since February 2003 when two rebel groups challenged the central government.[260] This conflict has often been cited as climate change driven by academics and policy makers alike. The general argument goes that climate change caused drought and water scarcity that put pastoralists and farmers into conflict and this spiraled into a wider regional conflagration.[261] However, other authors argue persuasively that the connections between climate change, migration, and conflict in the case of Darfur are weak and water scarcity is just one of the many elements at play.[262] The rebels claim they are discriminated against based on their ethnicity, deprived of political power, and have had their resources exploited.[263] These grievances have been exacerbated by local agro-pastoralist tension over water and grazing rights. However, the larger fight between the rebels and the central government resulted from government policies that failed to develop the region and exploited their resources to the benefit of Khartoum.[264] As in the Two Areas, Khartoum also armed rival militia groups, the notorious Janjaweed, which added even more dimensions to the conflict as rival ethnic groups became activated.[265]

As the conflicts in Darfur and the Two Areas have continued, and are being fought for similar reasons, there has been more cooperation under the umbrella of the Sudan Revolutionary Front (SRF) that is made up of various rebel groups. This organization has called for ending the marginalization of the peripheries and Khartoum's exploitation of resources, services to be based on census populations and not patronage, and enhanced land

260 Ted Dagne, *Sudan: The Crisis in Darfur and Status of the North-South Peace Agreement*, CRS Report No. RL33574 (Washington, DC: Congressional Research Service, 2011), 23, https://fas.org/sgp/crs/row/RL33574.pdf.

261 Selby and Hoffmann, "Beyond Scarcity," 364.

262 Selby and Hoffmann, 365–366.

263 Dagne, *Sudan: The Crisis in Darfur*, 23.

264 Jean-Baptiste Gallopin, *Bad Company: How Dark Money Threatens Sudan's Transition*, (European Council on Foreign Relations, 2020), 4, https://www.ecfr.eu/page/-/bad_company_how_dark_money_threatens_sudans_transition.pdf; Selby and Hoffmann, "Beyond Scarcity," 366.

265 Dagne, *Sudan: The Crisis in Darfur*, 27.

rights to help mitigate the effects of agro-pastoral violence.[266] Some of the groups under the umbrella have also changed their initial demands of self-determination if the government is willing to comply with their demands and commit to a secular state.[267] Despite this unity, the government continues to treat the conflicts as local and believes that they should be managed separately, which has only aggravated the SRF and prevented a comprehensive peace deal from being instituted.[268] Localized violence has flared up throughout Sudan this year, but with this fighting unable to affect the center, the violence has only perpetuated further conflict and discontent.[269] Continued violence only serves to further degrade the environment, create more food insecurity, and make addressing the underlying tensions more difficult.

Overall, long standing grievances brought about by underdevelopment and exploitation of the peripheral areas are serving as more direct causes of large scale conflict in Sudan. However, environmental degradation has continued to occur during, and partly as a result of, the fighting. People have moved away from their land because of warfare and reduced crop productivity. Migration has taken people away from conflict areas and has not been serving as a catalyst for violence. In this, the causal chain is reversed from what is expected in the literature as conflict is actually the variable driving migration and environmental degradation.

E. FARMER-PASTORALIST TENSIONS

In addition to its large-scale internal conflicts, Sudan experiences lower levels of violence as farmers and pastoralists frequently come into conflict as they compete over land and water rights. Pastoralist herders, making up roughly 10% of the population, have a long history in Sudan, as they developed seasonal migration practices to account for resource availability, with the effects of climate change making this method all the more

266 *Sudan's Spreading Conflict (I)*, 21–22.

267 Young, *Sudan Uprising*, 62.

268 *Sudan's Spreading Conflict (I)*, 38 and 42.

269 Gallopin, *Bad Company*, 7 and 20; Young, *Sudan Uprising*, 22.

useful, if challenging.[270] A major problem affecting this group is the expansion of mechanized agriculture that has restricted their migratory paths, deprived them of seasonal grazing areas, and curtailed their water access.[271] Mechanized farming has expanded to over 6.7 million hectares in the south and east of the country in an effort to produce more food for domestic consumption.[272] This expansion has led to the clearing of natural vegetation and forests, which has restricted pastoralist access to resources for their herds.[273]

Until the mid 1980s, the government had instituted dates when harvest must be complete, so pastoralist herds could graze on the land afterwards, but these policies were removed and farmers are now able to restrict pastoralists from their land and charge for access.[274] This has occurred as climate change is increasing the frequency of droughts and driving pastoralists to increasingly diminished areas to feed and water their herds. Pastoralists are having to travel further in order to feed their herds and diminishing grazing areas are then having to support a larger number of herds. Migration continues to be seasonal, but pastoralists are forced to travel further than ever before. This is putting more people in contact with each other in the search of diminishing resources. In this case, expanded migration is not caused by climate change as much as government policies that allowed for expansion of farming into traditional grazing areas.

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[270] Madeline Vellturo, "The Erosion of Pastoralism in the Sudano Sahel: Time to Recognize a Growing Security Threat?," Stimson Center, 2020, https://www.stimson.org/2020/the-erosion-of-pastoralism-in-the-sudano-sahel/; Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC*, 3.

[271] Sulieman and Elagib, "Implications of Climate, Land-Use and Land-Cover Changes for Pastoralism in Eastern Sudan," 133; *East Africa and the Horn in 2022: An Outlook for Strategic Positioning in the Region*, (Inter-Agency Regional Analysts Network, 2017), 5, https://www.iris-france.org/wp-content/uploads/2017/03/IARAN-East-Africa-to-2022-revised.pdf.

[272] FAO, *2019 FAO Crop and Food Supply Assessment Mission to the Sudan*, 12; Mahgoub, *Current Status of Agriculture and Future Challenges in Sudan*, 12; Ministry of Environment, Forestry and Physical Development, *Sudan's Second National Communication Under the UNFCCC*, 6.

[273] Sulieman and Elagib, "Implications of Climate, Land-Use and Land-Cover Changes for Pastoralism in Eastern Sudan," 133; Hussein Sulieman and Abdel Ghaffar Ahmed, "Mapping the Pastoral Migratory Patterns Under Land Appropriation in East Sudan: The Case of the Lahaween Ethnic Group," *The Geographic Journal* (May 2016): 386, https://doi.org/10.1111/geoj.12175.

[274] Sulieman, and Ahmed, 391; FAO, *2019 FAO Crop and Food Supply Assessment Mission to the Sudan*, 12.

Climate change is playing a part in forcing the pastoralists to travel further as grazing areas face rainfall variance and droughts that causes them to be less efficient, despite not being the primary factor. Concurrently, farmers gain control of more land and pastoralists are deprived as a result creating tensions between the groups. Clashes between them are common with many state governments setting up committees to resolve disputes as conflicts have erupted in Blue Nile, Sennar, North Kordofan, and White Nile states.[275] These clashes are often seasonally based as pastoralists bring their herds south through increasingly narrow transit corridors with larger herds being met with diminished resource access.[276] These increasingly commonplace conflicts have frequently been politicized and framed as ethnic tensions that the central government cannot manage rather than as conflict over diminishing resources and poor allocation.[277] The fighting between pastoralists and farmers is the best example of climate change influencing migration and that migration causing conflict as groups battle over finite resources, despite not reaching the scale or severity of the regional conflicts.

F. URBAN CONFLICT AND THE 2019 GOVERNMENT TRANSITION

The overall role of environmental migration on conflict may be limited, but it is likely that it played a partial factor in the 2019 protests and overthrow of the Bashir regime. The secession of South Sudan and presence of long running conflicts severely restricted government capacity to provide services while migrants continued to move to cities seeking reliable access to those same services. Seeking to cut spending, the state reduced subsidies, which caused a rise in bread and fuel prices nationwide with the highest prices pushed to the peripheral regions to try and avoid unrest in Khartoum.[278] Shortages had occurred in addition to the price increases and the state was unable to meet citizen

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[275] FAO, 13 and 39.

[276] Ali Abdel Kareim Hameed et al., *Literature Assessment on Drought in Sudan*, ISSN 1503–0601, (Oslo, Norway: Drylands Coordination Group, 2011), 9, https://www.utviklingsfondet.no/dcg/assets/documents/Publications/1098-dcg_report_69.pdf.

[277] Chavunduka and Bromley, "Climate, Carbon, Civil War and Flexible Boundaries," 913.

[278] John Young, *Sudan Uprising: Popular Struggles, Elite Compromises, and Revolution Betrayed*, ISBN 978–2-940548-83-5, (Switzerland: Small Arms Survey, 2020), 9–10 and 36, http://www.smallarmssurveysudan.org/fileadmin/docs/reports/HSBA-Report-Sudan-Uprising.pdf.

demand.[279] Demonstrations started in the capital of Blue Nile state in 2018 and spread throughout the nation, with the largest in Khartoum where the population was concentrated.[280] While not a direct line to environmental migration, far from it, as the Bashir regime sought to prioritize the needs of Khartoum he deprived the peripheral regions, which made them more susceptible to environmental degradation. As citizens moved to cities, it increased the resources the state needed to supply to maintain stability. Many factors led to the revolution and ensuing government overthrow, but the increased demand brought about by migration is likely to have played a contributing factor. The successful overthrow could be acting as a potential intervening variable that prevented migration from leading to conflict in Khartoum and allowed for the conflict to remain in the peripheral regions. However, this outlet only works if the transitional regime is able to provide for the citizens as the Bashir regime did not.

G. CONCLUDING THOUGHTS

Migration in Sudan has many intertwined causes, with conflict and drought acting as the two largest push factors for displacement. Dry seasons and drought push people off their land yearly and in much larger quantities during severe droughts. Droughts make farming less efficient and forces people to move to urban centers in search of alternative livelihoods and access to food, water, and services. Some people move because of food and water scarcity, but that scarcity is caused by climate change acting in conjunction with other factors. Migrants are not just environmental but also economic as they flee war for a better life in Khartoum. Some of this movement is permanent, but often these migrants tend to go back to their land once rain returns in an attempt to continue farming. However, conflict remains the more important variable in causing the flow of people acting as the source of more than two thirds of the total movement in Sudan during 2019.

Environmental migration has limited impact on conflict in Sudan. The civil wars and large regional conflicts have centered around grievances against the national government that has exploited and underdeveloped the conflict-riven peripheral regions.

[279] Young, 36.

[280] Hassan, *Spilling Over*, 49.

Migrants are present, but they are the result of the fighting and not the cause. Environmental migration is more of a factor in farmer-pastoralist tensions but this migration is also influenced by government policies that have allowed farmers to keep pastoralists off grazing land. Pastoralists have had to travel farther to reach diminished and less productive grazing land and come into conflict with farmers seasonally. Despite this, the fighting is at a low level relative to the large scale regional fighting that is not shaped by migration. Migration also played a contributing factor in the 2019 revolution as the presence of migrants in urban areas allowed for even more widespread demonstrations against unmet citizen demands.

With an uncertain future for the transitional government there is still a potential for climate change to continue adding stress on a nation overburdened with issues. If the state is unable to provide reliable food, water, and housing to its citizens there is potential for further protests. If citizens rise up again there is a chance for more direct involvement of environmental issues in causing conflict in Sudan. Migration may not need to act as an intervening variable if the government does not increase service provisions and stop the privileging of the center at the expense of peripheral regions, regions that are the most negatively affected by climate change. Until that possibility, migration in Sudan is not directly caused by climate change but through the confluence of other factors that climate change adds to and conflict is not directly caused by migration as it remains in the periphery.

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IV. CONCLUSION

For years scholars have been looking at environmental degradation and climate change as possible drivers of migration and conflict. It seems everyone is producing an estimate on the severity of the climate change threat and the follow-on movement of people that it will cause, but these prognostications are often tilted in a negative and alarmist manner. This has made the problem seem nearly beyond the scope of government action. So far the worst of the predications has not occurred, but climate change remains present in scholarly and political debate, with more focus on it as time has progressed. As international attempts to reduce greenhouse gas have proven inadequate and arctic ice shelves continue to melt at accelerated rates, there is still time to address climate change—but also time for the dour estimates to become reality.

To determine how climate change has affected migration and conflict, this thesis looked at its effects in Egypt and Sudan. In both cases climate change is present, but it grafts on to already complex societies facing multiple issues. Egypt, with excessive reliance on the Nile, a growing population, increasingly inefficient farming, and a budding dispute over Nile control with Ethiopia, can ill afford to deal with the challenges climate change brings. Despite these myriad issues, migration from environmental degradation has been limited in Egypt due to extreme population density and urban areas already overburdened with a growing youth bulge. Scholars propose that technological and market solutions can prevent migration. But Egypt has engaged in neither, yet migration has still been minimal. Conflict there is generally unrelated to environmental issues.

In Sudan, conflict and migration have been present since the start of the country, with constant civil wars and regional disputes displacing millions. This is in addition to the droughts that have also forced people off their land. The conflicts are so multifaceted and complex that to reduce them down to climate change, as some attempted with Darfur, is to oversimplify purely for argument sake. Such a simplification also shifts the focus to climate change, and not socio-political issues that climate change interacts with. It appears that climate change is a factor in driving migration in Sudan but it is secondary to conflict causing movement. Climate change is ruining agricultural land, pushing pastoralists further

from their traditional grazing lands, and forcing people to move, but conflict is also doing this and to a much larger degree. Even when environmental migration is present it is not directly causing conflict, except in small levels with farmer and pastoralist violence. The large scale conflict that has occurred in Sudan is caused more by grievances from political exploitation than any other factor. While conflict is not being caused by environmental migrants, climate change still is adding stress on the state.

Climate change does not occur in a vacuum. It takes place in states that all have their individual issues and challenges shaped by the political and economic situations present in the nation. As such, there is no one-size-fits-all answer on the nexus of climate change, migration, and conflict. If the conditions are right climate change can make migration more likely as has happened in Sudan. If there are limited places to go internally like in Egypt, migration can not be an adaptation technique. Conflict can take place when people move from environmental stress, but this is most likely when there are already underlying issues present in society that are made worse by this movement of people. Theories on the linkages are good places to begin analysis, but to truly understand how climate change will shape a nation one must look specifically at that state and determine the underlying conditions that will be made worse. Making a theory too specific prevents its general applicability, and undermines its usefulness, but any general theory on climate change causing migration and conflict is liable to fail due to the unique situations within states.

So where does this leave us? Does climate change cause migration? It can and will continue to do so in some cases but not others. Does climate change-induced migration cause conflict? It can add to the grievances that help create conflict but as a sole variable it appears unlikely to do so. In the case of Sudan is just one of the many factors that continues to drive conflict. Despite this murky linkage, any action done to mitigate the severity of climate change will be worthwhile for governments to pursue. If climate change does negatively impact some nations, then working to solve the issue on the front end will require fewer resources than doing it after conflict has started. Mitigation is an area where a little effort now can prevent a lot of effort down the road. The most severe effects of climate change have been forecasted to hit the developing world and as climate change

worsens, the United States is beginning its shift to a position of Great Power Competition. Focusing on potential near-peer competitors seems like a reasonable thing to do, but discounting climate change and the negative impacts that it can bring across the developing world will make future problems and destabilizing actions all the worse. Action taken now will help to mitigate the effects on these nations, build relationships, and prevent these issues from being overlooked in the face of more traditional security threats. Just because climate change is complex does not mean that it should be ignored or treated as a lower-priority issue.

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