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**THE PERFECT STORM: CLIMATE-INDUCED
MIGRATION TO THE UNITED STATES**

by

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September 2020

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TO THE UNITED STATES**

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ABSTRACT

From the Mariel boatlift in the 1980s to the recent mass migration of familial units from the Northern Triangle in 2019, the United States has consistently been unprepared to handle mass migration events. With the world approximately 1.0°C warmer than pre-industrial levels, climatic-driven migration events will now challenge the U.S. borders. This thesis explores how the United States might prepare to handle cross-border climate change–induced migration from a homeland security perspective. Using the research methodology of scenario planning, this study assesses the many ways the future might unfold by focusing on intersecting global megatrends and an array of global warming projections in the year 2050. As a result, this thesis finds that regardless of how the world chooses to combat global warming in the coming decades, migration will continue. If the United States is to prepare for such a future, regional agreements and national legislation will be necessary. In turn, if leveraged correctly, climate migrants can help the United States compete with future emerging economies. This thesis ultimately concludes that a proactive approach to cross-border climate change–induced migration might not only benefit climate migrants but also the future resiliency of United States well into the mid-century.

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LIST OF ACRONYMS AND ABBREVIATIONS

BECCS	bioenergy with carbon capture and storage
CBP	Customs and Border Protection
DHS	Department of Homeland Security
GDP	gross domestic product
ICE	Immigration Customs and Enforcement
ISIS	Islamic State of Iraq and Syria
IPCC	Intergovernmental Panel on Climate Change
STEEP	social technological economic environmental political (analysis)
UAE	United Arab Emirates
UN	United Nations
USCG	U.S. Coast Guard
USCIS	U.S. Citizenship and Immigration Services

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EXECUTIVE SUMMARY

In the year 2020, climate change has proven itself a threat multiplier, amplifying risks to U.S. security today, and well into the future. Warming global temperatures affect not only the environment but also the foundation of human society by exacerbating pre-existing economic, environmental, and political instabilities.¹ In terms of human displacement, climate change is likely to have a distinct impact on future migration patterns. Currently, estimates predict that climate change might displace between 25 million to one billion people by the year 2050.² When contemplating the security of the United States, such mass population movements are likely to have a serious impact on the future security of the nation, especially in terms of the mission of the Department of Homeland Security (DHS). An inherent part of the DHS mission is to “secure U.S. borders and approaches.”³ Yet, history demonstrates that the United States has consistently been unprepared to handle mass migration events, as evidenced by the Mariel boatlift of the 1980s and the recent mass migration of familial units from the Northern Triangle to the U.S. Southern Border throughout 2019. Without a proactive framework, it is highly plausible that the United States will once again find itself mired in another border crisis—this time spurred by the effects of climate change.

While increasingly recognized as an international issue, no agreed upon global framework exists to address climate-induced migration. Further complicating the matter, climate change–induced migrants do not meet the definition of either a refugee or an asylee. Within the United States specifically, no immigration law or policy addresses the environmentally displaced. Having few legal alternatives, people may still come to the

¹ Grant Gordon and Ravi Gurumurthy, “Climate Change: How Global Warming Exacerbates Conflict,” in *Displaced*, March 26, 2019, podcast, MP3 audio, 52:34, <https://www.rescue.org/displaced-season-2/climate-change-how-global-warming-exacerbates-conflict>.

² International Organization for Migration, *IOM Outlook on Migration, Environment and Climate Change* (Geneva: International Organization for Migration, 2014), 38, <https://environmentalmigration.iom.int/iom-outlook-migration-environment-and-climate-change-1>.

³ Department of Homeland Security, *The DHS Strategic Plan: Fiscal Years 2020–2024* (Washington, DC: Department of Homeland Security, 2019), 17, https://www.dhs.gov/sites/default/files/publications/19_0702_plcy_dhs-strategic-plan-fy20-24.pdf.

United States to escape the destructive effects of climate change. This thesis offers recommendations for how the United States might prepare to handle such a scenario if, and when, mass cross-border climate-induced migration occurs.

The future holds innumerable uncertainties. Knowing precisely how U.S. homeland security will look in the coming decades is impossible. The same difficulty holds true for climate-induced migration and its potential effects on the U.S. immigration system. Therefore, this thesis explores how the United States might prepare to handle climate-induced migration by assessing a variety of alternative futures. Using the “what if” scenario planning methodology developed by the Royal Dutch Shell Company, this study assessed the many ways the future might unfold by focusing on intersecting global megatrends and a range of global warming and CO₂ pathways in the year 2050.⁴ The analysis of both scenarios, in turn, revealed three reoccurring themes. First, migration is a form of adaptation to a multitude of push-and-pull factors. Second, the changing nature of international power and negotiation will make future international resolutions difficult to achieve. Thus, regional and national agreements could prove far more time efficient and advantageous to both the receiving and departing nations. Finally, if leveraged correctly, critical uncertainties, especially those related to migration and climate change, could help the United States compete with future emerging economies. While U.S. policymakers might not be able to control how climate change-induced migration will occur, they can prepare for it by giving equal attention and consideration to multiple versions of the future, weighing options, and implementing cost-effective decisions.

When it comes to policies, practices, and procedures, this thesis makes the following seven recommendations:

⁴ Shell, “Navigating an Uncertain Future,” December 10, 2017, YouTube, video, 4:31, https://www.youtube.com/watch?v=nwub4Bhr-aM&feature=emb_logo.

1. DHS should incorporate climate change into all six homeland security missions and update the *DHS Strategic Plan* accordingly. The effects of climate change will impact DHS in its entirety, not only the U.S. immigration system. Instead of reinventing the wheel, DHS should re-assess the prior recommendations and actions laid out in the former *DHS Climate Action Plan*, and reinstitute best practices as appropriate.
2. In terms of immigration, DHS and its immigration sub-branches should re-assess the impacts climate change will have on mass migrations from the Caribbean, Central America, and South America.
3. The Department of State should expand the scope of the Caribbean Basin Security Initiative to include climate-induced migration and its related security implications.
4. The United States should pursue a regional free-movement agreement with the Caribbean Islands focused on climate-induced migration. In addition, Congress should consider creating a Caribbean-specific temporary visa program focused on critical job shortages, using Australia's Pacific Labour Scheme as an example.
5. Congress should assess expanding the United States–Mexico–Canada Agreement to include other countries in the region (e.g., Central and South America). Additionally, the types of eligible workers for the TN visa category should be expanded to those within non-professional fields.
6. Congress should amend current immigration law to increase the annual statutory limit on H-1B and H-2B worker visas as a preemptive method to promote legal and well-regulated migration versus climate-induced mass-migration events.
7. Finally, the United States should pursue a North American regional agreement regulating the use of geoengineering for near-term implementation. At the same time, the United States should continue

negotiations at an international level for worldwide regulations of geoengineering for long-term implementation.

Ultimately, this thesis offers a broad range of recommendations that could be pursued by U.S. policymakers when contemplating the future threats and opportunities of cross-border climate change–induced migration. Only the future will tell whether such recommendations might succeed. Nevertheless, it is apparent, more than ever, that the United States proactively prepare for such a future. For it is not a matter of if climate-induced mass-migration will happen, but rather when.

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Life rarely goes as planned. Case in point is the year 2020. Yet, here I am with a completed thesis, and so many people to thank.

To my dear husband, Adam, thank you for putting up with me over these last 15 months. Your support, and amazing culinary skills, powered me through all the ups and downs of writing a thesis.

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I. INTRODUCTION

In the year 2020, climate change has proven itself a threat multiplier, amplifying risks to U.S. security today, and well into the future. Warming global temperatures affect not only the environment but also the foundation of human society by exacerbating pre-existing economic, environmental, and political challenges and, ultimately, increasing countries' vulnerability to political instability, civil unrest, and conflict. Human displacement, and subsequent migration, is but one of many ways that climate change is reshaping the world and geopolitics.¹ In the context of the United States, such mass population movements are likely to have a serious impact on the homeland security of our nation.

A. RESEARCH QUESTION

This thesis answers the following question: How might the United States prepare to handle cross-border climate change–induced migration?

B. PROBLEM STATEMENT

On January 29, 2019, the Director of National Intelligence, Daniel R. Coats, released the *2019 Worldwide Threat Assessment of the U.S. Intelligence Community*. The report highlights the resulting global human-security challenges attributable to environmental degradation and climate change and how the two will inevitably affect the United States.² The report anticipates dire consequences:

¹ Grant Gordon and Ravi Gurumurthy, “Climate Change: How Global Warming Exacerbates Conflict,” in *Displaced*, March 26, 2019, podcast, MP3 audio, 52:34, <https://www.rescue.org/displaced-season-2/climate-change-how-global-warming-exacerbates-conflict>.

² Daniel Coats, *Statement for the Record: 2019 Worldwide Threat Assessment of the U.S. Intelligence Community* (Washington, DC: Office of the Director of National Intelligence, 2019), 21, <https://www.odni.gov/index.php/newsroom/congressional-testimonies/item/1947-statement-for-the-record-worldwide-threat-assessment-of-the-us-intelligence-community>.

climate hazards such as extreme weather, higher temperatures, droughts, floods, wildfires, storms, sea level rise, soil degradation, and acidifying oceans are intensifying, threatening infrastructure, health, and water and food security.³

Because of these environmental changes, the *Worldwide Threat Assessment* predicts that human displacement and migration will pose a significant challenge to U.S. security.⁴ Coats's report acknowledges that global movement will likely remain high, and the environmentally displaced will probably not return home.⁵ Even the 2013 Department of Homeland Security (DHS)'s *Climate Action Plan* discusses the depth of the impact such migration poses to the nation's security.⁶ The plan warns that because of climate change, the United States could see more mass movements of populations, both legally and illegally, from Mexico, Central America, and the Caribbean.⁷ The plan also notes that the United States might need to prepare for frequent, temporary, disaster-driven mass-migration events. The report concludes that these fluctuations in migration "could result in changes to DHS legal authorities, policies, procedures, and operation."⁸ Thus, climate change and mass human displacement will have a direct effect on the U.S. immigration system.⁹

³ Coats, 23.

⁴ This climate-induced migration can be predicated for two types of events: sudden-onset disasters (e.g., hurricanes, flooding, and mudslides) or slow-onset disasters due to ecological degradation (e.g., rising sea levels, ocean acidification, salination of water supplies, and desertification) "About Us," Nansen Initiative, accessed July 13, 2019, <https://www.nanseninitiative.org/secretariat/>.

⁵ Coats, *Statement for the Record*, 24. The ultimate factor that forces migration might not be directly linked to climate change but to the secondary and tertiary effects of climatic events (e.g., loss of work, loss of inhabitable land, and limited food and water sources). Bonnie Docherty and Tyler Giannini, "Confronting a Rising Tide: A Proposal for a Convention on Climate Change Refugees," *Harvard Environmental Law Review* 33, no. 2 (2009): 349–403.

⁶ Department of Homeland Security, *DHS Climate Action Plan* (Washington, DC: Department of Homeland Security, 2013), <https://www.dhs.gov/sites/default/files/publications/DHS%20Climate%20Action%20Plan.pdf>.

⁷ Department of Homeland Security, 11.

⁸ Department of Homeland Security, 12.

⁹ Department of Homeland Security.

The mission of DHS centers around safeguarding the United States, the public, and American values.¹⁰ An inherent part of this mission involves “secur [ing] U.S. borders and approaches.”¹¹ Listed as the second goal of *The DHS Strategic Plan: Fiscal Years 2020–2024*, this objective requires interoperability and cooperation among numerous DHS agencies. Customs and Border Protection (CBP), Immigration and Customs Enforcement (ICE), U.S. Citizenship and Immigration Services (USCIS), U.S. Coast Guard (USCG), and the Transportation Security Administration all play a role in U.S. border security and enforcement of immigration law.¹² Thus, climate-induced migration not only threatens the mission of DHS but, ultimately, the sovereignty of our nation. The security of the nation’s borders, enforcement of its immigration laws, and the administration of its immigration benefits all hang in the balance if climate-induced migration occurs as predicted.¹³ Yet, no U.S. immigration law or policy anticipates these new types of migrants and the future security challenges they pose.

To be sure, a thorough review of immigration law and policy reveals that few legal options exist for people driven from their homes because of environmental degradation. A climate-induced migrant does not meet the definition of either a refugee or an asylee. The Immigration and Nationality Act, as codified in 8 U.S.C. § 1101, defines a refugee as follows:

(A) Any person who is outside any country of such person’s nationality or, in the case of a person having no nationality, is outside any country in which such person last habitually resided, and who is unable or unwilling to return to, and is unable or unwilling to avail himself or herself of the protection of, that country because of persecution or a well-founded fear of persecution on account of race, religion, nationality, membership in a particular social group, or political opinion, or (B) in such special circumstances as the President after appropriate consultation (as defined in section 1157(e) of this title) may specify, any person who is within the country of such person’s nationality or, in the case of a person having no nationality, within

¹⁰ Department of Homeland Security, *The DHS Strategic Plan: Fiscal Years 2020–2024* (Washington, DC: Department of Homeland Security, 2019), 3, https://www.dhs.gov/sites/default/files/publications/19_0702_plcy_dhs-strategic-plan-fy20-24.pdf.

¹¹ Department of Homeland Security, 17.

¹² Department of Homeland Security, 7.

¹³ Department of Homeland Security, 18–25.

the country in which such person is habitually residing, and who is persecuted or who has a well-founded fear of persecution on account of race, religion, nationality, membership in a particular social group, or political opinion.¹⁴

Therefore, to qualify for asylum, a person must first meet the definition of a refugee.¹⁵ Outside of a refugee or asylum claim, the current state of U.S. immigration laws and policies provides even fewer options. Although humanitarian programs exist, these policies would not allow an environmentally displaced migrant to remain in the United States indefinitely.¹⁶ Despite few legal alternatives, climate migrants may still come to the United States to escape their inhabitable nations. This thesis offers recommendations on how the United States might prepare to handle such a scenario if mass cross-border climate-induced migration were to occur in the future.

C. LITERATURE REVIEW

This literature review explores the current scholarly debates surrounding climate-induced migration. Based on the evaluation of literature, many academics and scientists concur that mass population movements will happen but differ in their predictions on the specific timing. Similarly, many within the field of study also differ on the best policy response to climate-induced migration—be it new national law, an amendment to existing law, an international framework, or a regional mechanism. The first section of the literature review covers current debates on climate-induced migration, and the second focuses on proposed policy frameworks at both the international and regional level regarding the effects of climate-induced migration.

¹⁴ Immigration and Nationality Act, 8 U.S.C. § 1101(a)(42) (1980), <https://uscode.house.gov/view.xhtml?req=granuleid%3AUSC-prelim-title8-section1101&num=0&edition=prelim>.

¹⁵ United Nations Convention Relating to the Status of Refugees, July 28, 1951, 189 U.N.T.S. 137, <https://www.unhcr.org/protection/basic/3b66c2aa10/convention-protocol-relating-status-refugees.html>.

¹⁶ “Temporary Protected Status,” Citizenship and Immigration Services, May 13, 2019, <https://www.uscis.gov/humanitarian/temporary-protected-status>.

1. On Climate-Induced Migration

Many scientists and scholars contend that the effects of climate change will invoke mass movements of populations over the remainder of the 21st century and onward. In this connection, the Intergovernmental Panel on Climate Change (IPCC) projects that climate change will increase human displacement. In its fifth assessment report, published in 2014, the IPCC describes the likelihood that such events will occur among populations exposed to the various effects of climate change—drought, rising sea levels, flooding, and severe weather events. According to the IPCC, people located in developing countries will be particularly vulnerable to such events.¹⁷ As a form of adaptation, these populations may choose to migrate to lessen their vulnerability to climatic variability.

Further drawing on the findings of the IPCC, the United Nations (UN) also highlights the impact of climate-induced migration on developing countries, specifically small island developing states, hereafter referred to as small island states (see Figure 1).¹⁸

¹⁷ Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report*, ed. Core Writing Team, Rajendra K. Pachauri, and Leo Meyer (Geneva: Intergovernmental Panel on Climate Change, 2015), 16, https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf.

¹⁸ United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, *Small Island Developing States: Small Islands Big(ger) Stakes* (New York: United Nations, 2011), <http://unohrrls.org/custom-content/uploads/2013/08/SIDS-Small-Islands-Bigger-Stakes.pdf>.

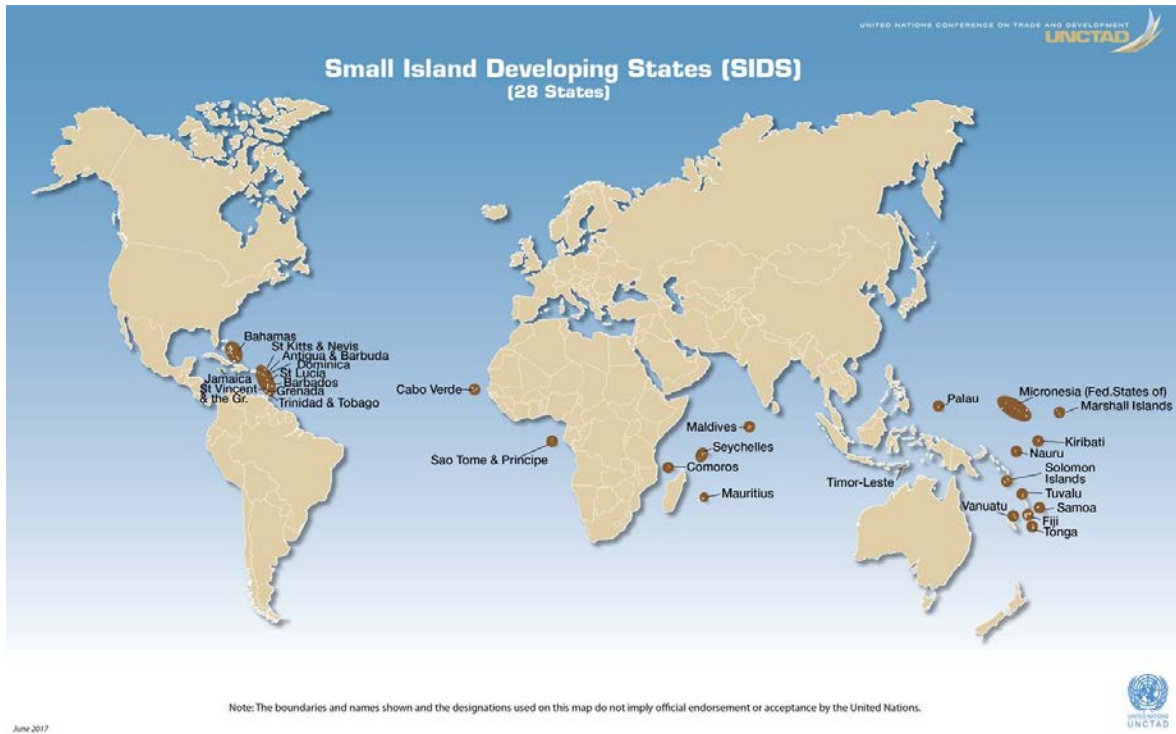


Figure 1. Map of Small Island Developing States¹⁹

The UN reports that a high proportion of the population living in small island states will face “serious social migration and/or displacement challenges.”²⁰ The report concludes that any resulting displacement or resettlement could have a severe impact on small island states’ culture and society.²¹ In sum, the literature on climate change agrees that human movement is likely to occur in the future as a response to environmental degradation and climatic irregularity. Yet, little data exist on just how many people might be displaced by the effects of climate change in the future.

¹⁹ Source: “Small Island Developing States (SIDS),” United Nations Conference on Trade and Development, June 2017, https://unctad.org/en/PublishingImages/aldc_SIDS_map_large.jpg.

²⁰ United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, *Small Island Developing States in Numbers: Updated Climate Change* (New York: United Nations, 2017), 33, http://unohrrls.org/custom-content/uploads/2017/09/SIDS-In-Numbers_Updated-Climate-Change-Edition-2017.pdf.

²¹ United Nations, 33.

a. By the Numbers

Currently, estimates predict that climate change might displace between 25 million to one billion people by the year 2050.²² This wide range of data illustrates one of the greater challenges facing the study of climate-induced migration. As explained by the International Organization for Migration,

Notwithstanding significant advances in researching the migration-environment nexus, robust data sets and forecast remain largely elusive and true interdisciplinary research limited. The main challenges reside in the realms of causalities (e.g., to what extent the environment acts as a primary driver, what migration patterns emerge in response to different environmental stressors, what socioeconomic or other factors need to be considered with regard to vulnerability) and data.²³

By and large, the field of migration theories considers the movement of populations a multicausal phenomenon. Categorized as “push-and-pull” factors, these driving forces span a wide gamut of reasons why a person may choose to migrate. “Push” factors (e.g., violence, conflict, and natural disasters) are issues that force a person to consider migration. In contrast, economic opportunities, better healthcare, food, housing, and state assistance signify “pull” factors (i.e., potential benefits that entice a person to leave their homes).²⁴ Often, a person’s choice to migrate can involve a combination of both push and pull factors. As with the case of climate-induced migration, climate change will likely be one out of many contributing factors that influences a person’s decision to leave home. Although estimates vary widely on just how many people might be displaced in the future, the study of climate-induced migration continues to garner attention among scholars, with some even arguing it is already occurring.

²² International Organization for Migration, *IOM Outlook on Migration, Environment and Climate Change* (Geneva: International Organization for Migration, 2014), 38, <https://environmentalmigration.iom.int/iom-outlook-migration-environment-and-climate-change-1>.

²³ International Organization for Migration, 41.

²⁴ P. Krishnakumar and T. Indumathi, “Pull and Push Factors of Migration,” *Global Management Review* 8, no. 4 (August 2014): 8–13.

b. A Present Reality

Moving from the perspective of future-thinking to the present, a distinct group of scholars posits that climate change–induced migration is already happening. For example, Sergio O. Saldaña-Zorrilla and Krister Sandberg argue that climate-induced immigration is now occurring and will only increase in years to come.²⁵ In their study, Saldaña-Zorrilla and Sandberg focused on the out-migration of rural Mexican farmers to other areas of Mexico and the United States. The researchers examined how recurring natural disasters, primarily those related to climate change, have affected migration patterns in the region.²⁶ Using data from the 1990 and 2000 Mexico Census to run a migration model, the researchers discovered higher migration rates in regions with increasing poverty, declining crop prices, and frequent natural disasters. Ultimately, their research predicts that “as weather and climate-related disasters are becoming more frequent and destructive in Mexico . . . out-migration will continue to rise in the coming years if an active disaster prevention strategy and structural adaptation measures are not duly implemented.”²⁷ In the same vein of research, some scholars have argued a direct connection between climate change, migration, and resulting conflict.

Peter H. Gleick offers another poignant example of climate-induced migration in the case of Syria and its contributions to the country’s current civil war.²⁸ Gleick attributes the mass migration of rural communities to the cities because of the severe droughts that lasted from 2006 to 2011 in Syria. These droughts resulted in multi-year crop failures, eventually leading to mass population movements to the cities. In turn, these new migrants further added to current social unrest, unemployment, and economic stress.²⁹ Although

²⁵ Sergio O. Saldaña-Zorrilla and Krister Sandberg, “Impact of Climate-Related Disasters on Human Migration in Mexico: A Spatial Model,” *Climatic Change* 96, no. 1–2 (2009): 97–118, <http://dx.doi.org/10.1007/s10584-009-9577-3>.

²⁶ Saldaña-Zorrilla and Sandberg.

²⁷ Saldaña-Zorrilla and Sandberg, 114.

²⁸ Peter H. Gleick, “Water, Drought, Climate Change, and Conflict in Syria,” *Weather, Climate, and Society* 6, no. 3 (2014): 331–40, <https://doi.org/10.1175/WCAS-D-13-00059.1>.

²⁹ Gleick, 333.

Gleick's work offers yet another example of current climate-induced migration, counterarguments remain within the field of study.

Taking an alternative view on climate migration, Michael Brzoska and Christiane Fröhlich contend the relationship between environmental changes, migration, and subsequent conflict is non-linear.³⁰ The authors argue that environmental changes are but one of many contributing factors that influence a person's decision to migrate. In addition to environmental considerations, the authors maintain that political, economic, demographic, and social drivers will influence people to migrate. In most cases, the intersection of these migration drivers, therefore, make it difficult to determine to what degree the environment plays a role in a person's decision to migrate. The authors conclude that the current rhetoric surrounding future population movements overemphasizes environmental change as the sole contributor to migration.³¹

How migration patterns might transform the future has yet to be seen. The results of increasing global temperatures will nonetheless have a significant role in the social, political, environmental, economic, and demographic forces that drive future migration patterns. These ramifications, therefore, will have a significant impact on the future U.S. immigration system, and the country's borders.

2. Policy Response Frameworks

The security of the United States depends on the control of all sea, air, and land borders, including nearly 95,000 miles of coastlines and 6,000 miles of land borders.³² Thus, a mass approach of climate-induced migrants could threaten the homeland security of the country. Similarly, such migration will likely affect future geopolitics and the international community. As such, a variety of policy response frameworks address climate

³⁰ Michael Brzoska and Christiane Fröhlich, "Climate Change, Migration and Violent Conflict: Vulnerabilities, Pathways and Adaptation Strategies," *Migration and Development* 5, no. 2 (2016): 190–210, <https://doi.org/10.1080/21632324.2015.1022973>.

³¹ Brzoska and Fröhlich.

³² Department of Homeland Security, *Strategic Plan*, 18.

change-induced migration. This section offers three distinct approaches from a macro to a micro level by looking at the issue from international, regional, and national perspectives.

a. *International Frameworks*

Scientists and social science scholars have worked to create a variety of potential international frameworks that addresses climate-induced migration. Concerned about the lack of policy that addresses the societal issue, these academics have generated numerous propositions and recommendations. Bonnie Docherty and Tyler Giannini propose creating a new international legal instrument. In their view, the apparatus should be implemented by holding a climate change refugee convention, comparable to the 1951 UN Refugee Convention that first established the international definition of a refugee.³³ The proposed instrument would provide a mechanism to guarantee assistance to climate change refugees; a shared responsibility among the host, the home state, and the international community; and a detailed form of administration through a global fund and coordinating agency in conjunction with scientific experts.³⁴ Ultimately, the authors agree that the instrument would “guarantee human rights protections and humanitarian aid for those whom climate change compels to leave their countries.”³⁵ Other academic scholars, however, have found faults in Docherty and Giannini’s proposal to create a new international legal system to handle the challenges posed by climate-induced migration. Some scholars have instead called for an amendment to the 1951 UN Refugee Convention. Thus, universal agreement on how to handle climate change displacement remains elusive.

Rather than calling for an entirely new UN refugee convention, Frank Biermann and Ingrid Boas recommend the incorporation of a climate refugee protocol in the United Nations Framework Convention on Climate Change (hereafter UN Climate Change Convention). By integrating “climate refugees” into the UN Climate Change Convention,

³³ Docherty and Giannini, “Confronting a Rising Tide.”

³⁴ Docherty and Giannini, 12–13.

³⁵ Docherty and Giannini, 27.

the definition of a “refugee” per the 1951 Refugee Convention would remain unchanged.³⁶ In addition to the UN Climate Change Convention, the scholars also envision the cooperation of other agencies to facilitate the protocol, including the UN High Commissioner for Refugees, the UN Development Programme, and the World Bank.³⁷ While Docherty and Giannini differ from Biermann and Boas in the specific details of their policy recommendations, all agree climate change–induced migration should be addressed at the international level. Consequently, both also agree that implementation of the mechanism would require cooperation among multiple entities from the scientific community to the UN.

b. Regional Responses

In contrast to addressing climate-induced migration through an international framework, other scholars have argued for a regional response. For example, Graeme Hugo contends that pre-existing immigration policies should be reviewed and modified to meet the societal needs of a changing climate and global environments.³⁸ As a critic of creating an international mechanism, Hugo posits, “There is a real danger that migration responses will be formulated by nation-states and the international community with little recognition of existing migration patterns, processes, and policies.”³⁹ Looking to Asia and the Pacific for an example, Hugo explains that social networks greatly influence migration streams. Known as social network theory, this principle centers around the idea that people are more likely to migrate to areas through ties based on “kinship, friendship, and a shared community origin.”⁴⁰ Thus, Hugo proposes that modifications to current migration systems are more easily achieved than the creation of an entirely new international

³⁶ Frank Biermann and Ingrid Boas, “Preparing for a Warmer World: Towards a Global Governance System to Protect Climate Refugees,” *Global Environmental Politics* 10, no. 1 (February 2010): 78, <https://doi.org/10.1162/glep.2010.10.1.60>.

³⁷ Biermann and Boas, 79.

³⁸ Graeme Hugo, “Climate Change-Induced Mobility and the Existing Migration Regime in Asia and Pacific,” in *Climate Change and Displacement: Multidisciplinary Perspectives*, ed. Jane McAdam (Portland: Hart Publishing, 2010), 10.

³⁹ Hugo, 31.

⁴⁰ Hugo, 31.

standard.⁴¹ For example, Hugo alludes to New Zealand's temporary and permanent migration categories that could be modified to accommodate climate-induced migrants from the Pacific. In terms of temporary protection, the Recognized Seasonal Employer Scheme or the Work Permit Scheme could also be amended to meet the needs of this group of migrants. Conversely, the International Humanitarian Migration, Pacific Access Category, and Western Samoan Quota Schemes represent some of the many permanent settlement options that could be adjusted for climate migrants.⁴² In summary, Hugo offers a micro-level solution to climate-induced migration versus the more publicized call for an international mandate.

Drawing further on the idea of the need for regional responses to climate-induced migration, the Australian Department of Defence published its *2016 Defence White Paper*, in which it assesses the security and safety of the country over the next two decades.⁴³ The document highlights the importance of a stable nearer region concerning the country's overall security, explaining that the challenges Australia's Pacific island neighbors will face in the future could jeopardize the overall safety of the Pacific. As the Australian Department of Defence precisely describes,

to help countries in our immediate neighborhood respond to the challenges they face, Australia will continue to play an important regional leadership role. Our strategic weight, proximity, and resources place high expectations on us to respond to instability or natural disasters, and climate change means we will be called on to do so more often.⁴⁴

The *2016 Defence White Paper* set in motion Australia's plans to further engage with its regional neighbors, eventually resulting in the creation of Australia's Pacific Step-Up Program. On July 1, 2018, as part of the program, Australia launched the Pacific Labour Scheme to promote increased labor mobility between Australia and its Pacific regional neighbors.

⁴¹ Hugo, 33.

⁴² Hugo, 34.

⁴³ Australian Department of Defence, *2016 Defence White Paper* (Canberra: Commonwealth of Australia, 2016), 9, <https://www.defence.gov.au/WhitePaper/Docs/2016-Defence-White-Paper.pdf>.

⁴⁴ Australian Department of Defence, 56.

The Pacific Labour Scheme provides low and semi-skilled worker visas to citizens of Pacific small island states, specifically Tonga, Tuvalu, Timor-Leste, Vanuatu, Solomon Island, Papua New Guinea, Kiribati, Fiji, Nauru, and Samoa. The scheme focuses on occupations within the food and tourist industries; health care, especially among the elderly and disabled; and non-seasonal agriculture (e.g., forestry and fishing). The Pacific Labour Scheme has no quota limits, unlike other worker visas. The goal is to drive the growth of the program through the demand of Australian employers. Although far from perfect, the Pacific Labour Scheme offers a proactive approach to ensure the future security of Australia through foreign policy and regional collaboration.

Similarly, some scholars have called for the creation and expansion of free-movement frameworks at the regional and sub-regional levels to include the environmentally displaced. Free-movement agreements, such as the European Union Schengen Area, allow individuals, to varying degrees, to travel, live, and work within the territories of the participating member states. Some scholars contend that such regional agreements could help facilitate migration of people displaced by climate change. As an example, Elizabeth Donger references the Mercado Común del Sur and the Andean Community as two pre-existing free-movement agreements that might position Latin America to better respond to climate-induced migration. Both allow citizens of the member states to move and work with minimal requirements within the territory. In fact, the permit granted under the 2002 Mercado Común del Sur agreements offers the opportunity for eventual permanent residency if the person meets the eligibility requirements.⁴⁵

Using a comparable argument, Ama Francis contends that the Caribbean Community and Organisation of Eastern Caribbean States are free-movement agreements that could be used as part of a climate-migration policy response. Performing a case study on the 2017 Atlantic hurricane season, Francis determined that both agreements greatly assisted those displaced by disaster. The agreements allowed those displaced the right to enter other member islands with the availability of a waiver for travel documents lost or damaged. Additionally, some of the displaced were even able to secure work and

⁴⁵ Elizabeth Donger, "Fleeing the Weather," *ReVista* 18, no. 3 (Spring 2018), ProQuest.

permanent resettlement.⁴⁶ Both Francis and Donger agree that free-movement agreements have potential applicability in policy responses to cross-border climate change-induced migration.

c. U.S. Strategy

On June 25, 2013, the Executive Office of the President released the *President's Climate Action Plan*, which outlined steps by which the United States would address the threat of climate change and its effects on future generations of Americans. The plan focused on cutting carbon pollution, preparing the country for the impacts of climate change, and serving as a leader in international efforts to combat and prepare for global climate change.⁴⁷ In September of that same year, the Department of Homeland Security released the 2013 *Climate Action Plan* in response to President Obama's order.

The premise of the plan was to evaluate the risks climate change poses to the five DHS missions outlined in the 2010 *Quadrennial Homeland Security Review*.⁴⁸ When discussing increasing severe weather and disasters, the plan acknowledges that such events “could increase population movements (both legal and illegal) across the U.S. border.”⁴⁹ In turn, the plan also notes, that these changes in migration patterns could fundamentally alter the ways in which DHS operates, along with its policies, procedures, and legal authority. As a result, the plan created a working group with representatives from CBP, ICE, USCIS, and USCG. The interagency group would carry out and coordinate a departmental assessment on behalf of DHS by focusing on “the projected influx of applications, border crossings, and related operational impacts from the Caribbean and

⁴⁶ Ama Francis, “Free Movement Agreements & Climate-Induced Migration: A Caribbean Case Study” (New York: Columbia University, 2019), <https://papers.ssrn.com/abstract=3464594>.

⁴⁷ Executive Office of the President, *President's Climate Action Plan* (Washington, DC: White House, June 2013), <https://obamawhitehouse.archives.gov/sites/default/files/image/president27sclimateactionplan.pdf>.

⁴⁸ The five DHS missions, according to the *Quadrennial Homeland Security Review*, are 1) terrorist attack prevention, 2) border security and management, 3) administration and enforcement of immigration laws, 4) a secure and safeguarded cyberspace, and 5) disaster resiliency. Department of Homeland Security, *Climate Action Plan*, 11.

⁴⁹ Department of Homeland Security, *Climate Action Plan*, 11.

abroad.”⁵⁰ The group would also focus on the sufficiency of current law and operations.⁵¹ Less than a year later, DHS released a follow-on document further outlining how the agency would continue to pursue climate change as part of the agency’s mission.

In June 2014, DHS issued an addendum to the 2013 *Climate Action Plan*. The addendum incorporated 18 near-term actions into the original plan, including the departmental review of climate-induced mass migrations. The document outlines the major actions taken as part of the departmental review: “Climate change effects on mass migration will be addressed by revising the DHS Maritime Migration Plan. The revisions will be completed by the Senior Oversight Group and Planning Oversight Group. The kickoff meeting was held May 13, 2014.”⁵² As part of the literature review, however, no document titled the *DHS Maritime Migration Plan* could be found, and no further updates to the *Climate Action Plan* could be located either. Although DHS appears to lack an active plan to address climate change, such work has not ceased in other areas of the U.S. security sector.

Recently, the Center for Climate and Security released a report assessing the security threats climate change poses to the United States and the international community collectively. Produced by a variety of national security, military, and intelligence professionals, the report highlights that “even at scenarios of low warming, each region of the world will face severe risks to national and global security in the next three decades.”⁵³ Just like other articles discussed in this literature review, the report acknowledges the particular importance of migration as a driver of instability and possible conflict as climate-induced migration becomes more frequent.⁵⁴ Ultimately, the report calls on the world to

⁵⁰ Department of Homeland Security, 19.

⁵¹ Department of Homeland Security, 19.

⁵² Department of Homeland Security, *DHS Climate Action Plan Addendum* (Washington, DC: Department of Homeland Security, 2014), 10, https://www.dhs.gov/sites/default/files/publications/Climate%20Action%20Plan%20Addendum%20June%202014%20%28508%20Compliant%29_0.pdf.

⁵³ Kate Guy, *A Security Threat Assessment of Global Climate Change: How Likely Warming Scenarios Indicate a Catastrophic Security Future*, ed. Francesco Femia and Caitlin Werrell (Washington, DC: Center for Climate and Security, 2020), <https://climateandsecurity.org/a-security-threat-assessment-of-global-climate-change/>.

⁵⁴ Guy, 21–22.

achieve net-zero global emissions and build resilience to the already occurring effects of climate change. At the national level, the report calls on the United States to renew its efforts to address and respond to the security threats climate change poses. Through continued demands for such oversight, some federal agencies have taken heed.

As part of the National Defense Authorization Act for Fiscal Year 2020, the Director of National Intelligence amended the National Security Act of 1947 by establishing the Climate Security Advisory Council. The premise of the newly created council is to focus on the national security implications of climate change as part of the U.S. intelligence community. The amendment also goes on to define climate security and its importance in the context of U.S. national security, global political stability, and the security of the allies and partners of the United States.⁵⁵ While the definition highlights the ongoing and potential impacts of climate security on warfare, political instability, and terrorism, it makes no mention of migration.

In conclusion, much debate remains surrounding climate change-induced migration and its future implications. With a lack of a definitive policy framework, the remainder of this thesis explores how the United States might prepare to handle cross-border climate change-induced migration through the lens of scenario planning.

D. THESIS ROADMAP

Chapter II outlines the scenario-planning research methodology. Chapter III and IV offer two scenarios, each built on different intersecting future megatrends coupled with key variables in CO₂ emissions, global warming, and migration patterns. Finally, Chapter V provides an analysis of both scenarios, accompanying findings and conclusions, and applicable policy recommendations.

⁵⁵ National Defense Authorization Act for Fiscal Year 2020, S. Res. 1790, 116th Cong. (2019), <https://www.congress.gov/bill/116th-congress/senate-bill/1790>.

II. RESEARCH DESIGN: SCENARIO PLANNING

The future holds innumerable uncertainties. Knowing precisely how U.S. homeland security will look in the coming decades is impossible. The same difficulty holds for climate-induced migration and its future effects on the U.S. immigration system. The methodology of scenario planning attempts to address the ambiguities of the future by having decisionmakers prepare for a variety of plausible alternatives. As explained by Thomas J. Chermack, “Scenario planning explores a variety of outcomes, a variety of potential answers, and uses them to create awareness and readiness.”⁵⁶ The research framework of scenario planning, thus, readily aligns with the purpose of this thesis to “create awareness and readiness” in the United States regarding cross-border climate-induced migration.

A. KEY ASSUMPTIONS

The year 2050 is an oft-cited date for projecting the future effects of global warming concerning greenhouse gas emission production. Many within the scientific community view 2050 as a clear boundary to limit further global warming well below 2°C, and ideally no higher than 1.5°C, as set forth by the Paris Climate Agreement.⁵⁷ Therefore, the significance of the year 2050 is two-fold: it allows me to explore a long-term outlook while incorporating current climate change and global projections from both the hard sciences and social sciences.

The scenarios explored in this thesis represent the intersection of global megatrends and critical variables related to migration and greenhouse gas emissions. Therefore, I assume that these trends and variables will evolve in the coming decades, sans any radical

⁵⁶ Thomas J. Chermack, *Scenario Planning in Organizations: How to Create, Use, and Assess Scenarios* (Oakland: Berrett-Koehler Publishers, 2011), 1.

⁵⁷ Myles Allen et al., “Summary for Policymakers,” in *Special Report: Global Warming of 1.5°C*, ed. V. Masson-Delmotte et al. (Geneva: Intergovernmental Panel on Climate Change, 2018), <https://www.ipcc.ch/sr15/>; United Nations Framework Convention on Climate Change, *Report of the Conference of the Parties on Its Twenty-First Session, Held in Paris from 30 November to 11 December 2015*, FCCC/CP/2015/10/Add.1 (New York: United Nations, 2016), <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>.

changes or black swan events that could drastically alter the course of the future.⁵⁸ Using the “what if” scenario planning methodology developed by the Royal Dutch Shell Company, it becomes possible to assess alternative future events when key megatrends and variables overlap.⁵⁹ By creating a variety of scenarios, I can postulate different ways in which the United States might prepare for cross-border climate-induced migration in the coming decades.

B. DATA COLLECTION THROUGH EXPLORATION

The first phase of the scenario planning process required me to gather data on global megatrends, migration, and climate change. I analyzed all three topics by employing the use of the Dudley Knox Library’s research database, Google Scholar, the Homeland Security Digital Library, ProQuest, the UN Digital Library, and websites for DHS, USCIS, ICE, and CBP. I performed keyword searches on immigration, migration, climate change, climate-induced migration, environmental degradation, scenario planning, future thinking, human displacement, refugee, homeland security, borders, and megatrends. Through the data collection process, I amassed various peer-reviewed journal articles, nonfiction books, national and international reports, and publications. I focused on collecting materials produced within the last five to 10 years to ensure that I developed my scenarios according to the most timely and relevant information.

C. SCENARIO PLANNING PROCESS

After amassing my data, I followed a scenario planning process based on an amalgamation of the scenario methodology of the Royal Dutch Shell Company, specifically

⁵⁸ Popularized by the author Nassim Nicholas Taleb, black swan events are highly unpredictable, rare events that significantly alter the course of human history. Marti Fischer, “Staff Engagement & Black Swan Events,” *Forbes*, March 10, 2020, <https://www.forbes.com/sites/martifischer/2020/03/10/staff-engagement-black-swan-events/>.

⁵⁹ Shell, “Navigating an Uncertain Future,” December 10, 2017, YouTube, video, 4:31, https://www.youtube.com/watch?v=nwub4Bhr-aM&feature=emb_logo.

the work of Ted Newland and Pierre Wack, and the Global Business Network.⁶⁰ I followed five steps as part of the scenario planning process: 1) identify driving forces by analyzing global megatrends, 2) determine critical uncertainties, 3) determine key variables and assess the plausibility of each, 4) develop scenarios based on critical uncertainties and key variables, and 5) assess the implications of the scenarios (see Figure 2).

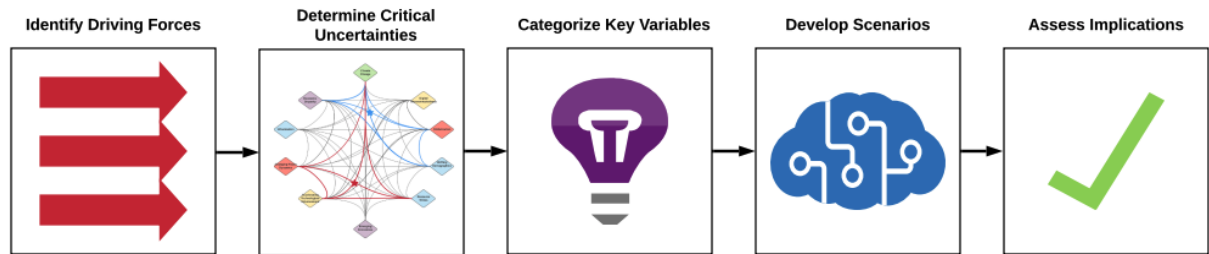


Figure 2. Scenario Planning Process⁶¹

Instead of focusing on future probability, I developed my scenarios in terms of plausibility. Concentrating on the intersection of global megatrends allowed me to identify critical uncertainties, a crucial step in the scenario planning process. I then analyzed key variables that could affect the trajectories of these megatrends—ultimately creating two unique scenarios based on a combination of both. In turn, these scenarios allowed me to explore how climate-induced migration might look in very different versions of the future.

D. DRIVING FORCES

Scenario planning relies on qualitative research and external analysis of the global environment. Focusing on major global trends allowed me to understand the driving forces that will likely influence the actions of humans in the future. In the context of this thesis, I wanted to explore how these driving forces will shape Americans' behaviors and attitudes

⁶⁰ Shell, "Navigating an Uncertain Future"; Peter Schwartz, *The Art of the Long View: Paths to Strategic Insight for Yourself and Your Company* (New York: Currency Doubleday, 1996); Angela Wilkinson and Roland Kupers, "Living in the Futures," *Harvard Business Review*, May 1, 2013, <https://hbr.org/2013/05/living-in-the-futures>.

⁶¹ Adapted from Schwartz, *Art of the Long View*.

toward climate change and immigration in the next 30 years, which will impact the decisions made by future U.S. governmental leaders regarding climate-induced migration.

I analyzed a variety of sources focusing on megatrends from the perspective of businesses, governments, and the world economy. The sources included future trend assessments at different timeframes, including the years 2030, 2035, and 2050. I identified significant megatrends from each and then partitioned them according to social, technological, economic, environmental, and political (STEEP) variables, thus determining the driving forces likely to influence the world in the upcoming decades (see Table 1).

Table 1. STEEP Analysis and Organization of Megatrends⁶²

SOURCE	SOCIAL	TECHNOLOGICAL	ECONOMIC	ENVIRONMENTAL	POLITICAL
Business Monitor International	• Urbanization • Demographic shifts	• Internet proliferation		• Climate change	• Globalization
Commonwealth Scientific and Industrial Research Organisation	• Aging populations • Increased consumer and societal expectations • Increasing demand for limited resources	• Accelerating technological advancement • Digitization	• Rapid growth in emerging economies and the developing world	• Challenges to the environment	
National Intelligence Council	• Shifting demographics in terms of wealth • Polarization driven by ideas and identities	• Progress in accelerating technology, but with resulting disruptions	• Shifts in global economy	• Climate change and its effects will demand attention	• Increasing difficulties in governance • Evolving conflict
KPMG International	• Demographics • Urbanization • Resource stress	• Enabling technology	• Economic interconnectedness • Public debt • Economic powershift	• Climate change	• Rise of the individual

⁶² Adapted from Business Monitor International, *Towards 2050: Megatrends in Industry, Politics and the Global Economy* (London: Fitch Solutions Group Limited, 2018), ProQuest; Stefan Hajkowicz, *Global Megatrends: Seven Patterns of Change Shaping Our Future* (Victoria, Australia: CSIRO Publishing, 2015), ProQuest; National Intelligence Council, *Global Trends: Paradox of Progress* (Washington, DC: National Intelligence Council, 2017), <https://www.dni.gov/index.php/global-trends/letter-nic-chairman>; KPMG International, *Future State 2030: The Global Megatrends Shaping Governments* (Amstelveen, Netherlands: KPMG International, 2013), https://www.worldgovernmentsummit.org/docs/default-source/publication/2016/future-states-2030/futurestate2030_en.pdf?sfvrsn=b5a80c0a_2; United Kingdom Ministry of Defence, *Global Strategic Trends: The Future Starts Today*, 6th ed. (London: United Kingdom Ministry of Defence, 2018), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/771309/Global_Strategic_Trends_-_The_Future_Starts_Today.pdf; Jacques Bughin and Jonathan Woetzel, “Navigating a World of Disruption,” McKinsey Global Institute, January 22, 2019, <https://www.mckinsey.com/featured-insights/innovation-and-growth/navigating-a-world-of-disruption>; World Economic Forum, *The Global Risks Report 2020*, 15th ed. (Geneva: World Economic Forum, 2020), http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf.

SOURCE	SOCIAL	TECHNOLOGICAL	ECONOMIC	ENVIRONMENTAL	POLITICAL
McKinsey Global Institute	• Industrialized nations are relying on alternative forms of productivity because of aging populations.	• Accelerating technology is creating opportunities and redefining the future of work.	• The global economy is shifting in favor of emerging economies and companies.		• Globalization patterns are changing based on data and emerging economies.
World Economic Forum	• Water crises • Infectious diseases • Food crises • Involuntary migration • Social instability	• Information infrastructure breakdown • Cyberattacks • Data fraud or theft	• Asset bubble	• Climate action failure • Biodiversity loss • Extreme weather • Natural disasters • Human-made environmental disasters	• Weapons of mass destruction • Global governance failure
United Kingdom Defence Ministry	• Rising inequality is reducing social cohesion and fragmenting societies • Demographic change • Increasing demand and competition for resources	• Harnessing artificial intelligence • Expanded and unregulated information space • Managing technological change • Greater automation and an increasingly diverse workforce • Understanding human enhancement	• The challenge of affordability	• Increasing disruption and cost of climate change	• Rising proliferation of weapons of mass destruction • Expanding competitive space • Erosion of state sovereignty • Increasing threat from crime and extremism • Adaptation of the rules-based international system • Increasing competition in the global commons

After amassing the megatrends according to their STEEP classification, I then consolidated the driving forces based on an analysis of recurring themes (see Table 2).

Table 2. Consolidation of Megatrend Drivers⁶³

SOCIAL	TECHNOLOGICAL	ECONOMIC	ENVIRONMENTAL	POLITICAL
• Shifting demographics • Resource stress	• Accelerating technological advancement • Digital interconnectedness	• Emerging economies • Economic disparity	• Climate change	• Changing power dynamics • Globalization

I then assessed how these megatrends might interconnect. Having any of these driving forces occur in a vacuum seems unlikely. Instead, they are likely to overlap. As more of these forces intersect, the future becomes more complex and unpredictable. Based on the thesis question, I assume that climate change is an underlying trend in all the scenarios. Although all the identified driving forces will inevitably influence the future, the two scenarios will focus on the interconnected variables highlighted in red for scenario one and blue for scenario two. A star denotes where the megatrends intersect and, subsequently, the critical uncertainty that each scenario holds (see Figure 3).

⁶³ Adapted from Business Monitor International, *Towards 2050*; Hajkowicz, *Global Megatrends*; National Intelligence Council, *Global Trends*; KPMG International, *Future State 2030*; United Kingdom Ministry of Defence, *Global Strategic Trends*; Bughin and Woetzel, “Global Trends”; World Economic Forum, *Global Risks Report 2020*.

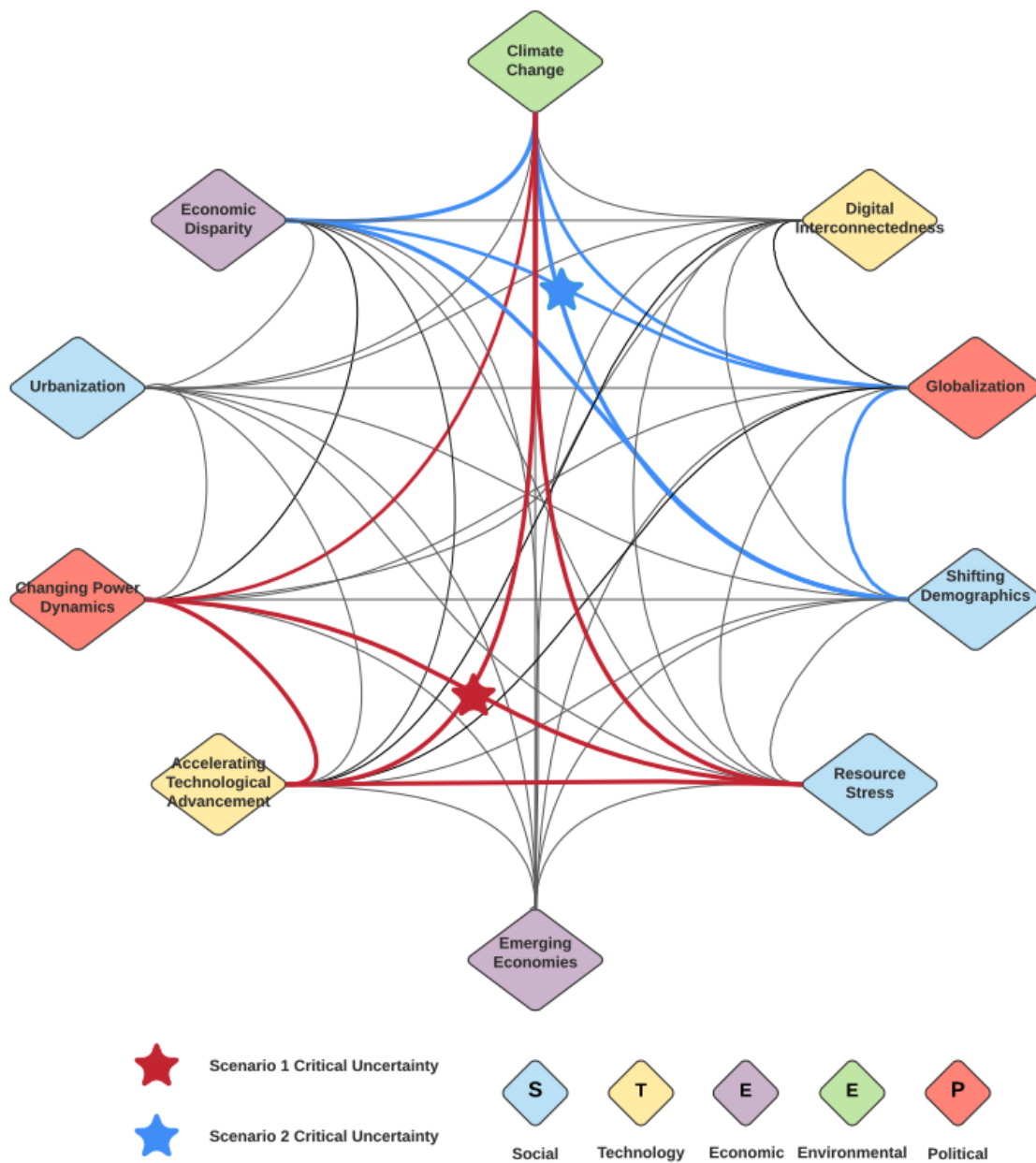


Figure 3. Megatrends Interconnection Map⁶⁴

⁶⁴ Adapted from Business Monitor International, *Towards 2050*; Hajkowicz, *Global Megatrends*; National Intelligence Council, *Global Trends*; KPMG International, *Future State 2030*; Bughin and Woetzel, "Global Trends"; World Economic Forum, *Global Risks Report 2020*.

E. KEY VARIABLES

After evaluating the driving forces that might influence the decision-making process of future U.S. leaders, I assessed potential variables that might significantly affect cross-border climate change–induced migration. While reviewing the collected data, I discovered two recurring themes when reviewing the literature on climate change–induced migration: future anthropogenic CO₂ emissions relative to temperature increase and the types of disasters that could spur population movement. Both topics represent key variables to consider as part of the scenario development process. This list of variables is not comprehensive, nor does it describe the full magnitude of factors that could spur climate-induced cross-border migration. Because of the inherent time restrictions of the thesis, I limited the number of potential variables to incorporate into the scenarios. As such, I focused on those most frequently referred to throughout the review of the collected data (see Table 3).

Table 3. Key Variables of Climate-Induced Migration⁶⁵

CO ₂ EMISSIONS RELATIVE TO TEMPERATURE	DISASTER TYPE
• Business as usual, few to no changes (2.1°C or higher) • Emission cuts according to the Paris Climate Agreement (2.0°C or less) • Radical cuts and net-negative emissions (1.5°C)	• Slow-Onset • Sudden-Onset

After partitioning the key variables into subcategories, I then performed a plausibility assessment based on the information gathered during the data collection process. I assigned each potential variable a plausibility classification, ranging from low, to medium, to high. This range represents the possibility of one of the variables occurring in the future. *High plausibility variables* represent current trends in global warming and

⁶⁵ Adapted from Intergovernmental Panel on Climate Change, *Climate Change 2014*, 58–60; Allen et al., “Summary for Policymakers”; United Nations, *Report of the Conference of the Parties*; “The Past, Present and Future of Climate Change,” *Economist*, September 21, 2019, <https://www.economist.com/briefing/2019/09/21/the-past-present-and-future-of-climate-change>; Nansen Initiative, *The Nansen Initiative Global Consultation Conference Report* (Geneva: Nansen Initiative, 2015), <https://www.nanseninitiative.org/global-consultations/>.

climate change–induced disasters. These variables are already occurring throughout the world. *Medium plausibility variables* are those that have not fully come to fruition but could happen in the coming decades based on climate change and global warming modeling. Significant data exist in this category but are still highly hypothetical. Finally, *low plausibility variables* are actions and events that would require significant disruption of current trends and projections (see Table 4).

Table 4. Variable Plausibility Classification⁶⁶

LOW	MEDIUM	HIGH
Radical cuts and net-negative CO₂ emissions (1.5°C)	- Emission cuts according to the Paris Climate Agreement (2.0°C or less) - Slow-onset disasters	- Business as usual (2.1°C or higher) - Sudden-onset disasters

Ultimately, I classified the variables in order to incorporate a broader range of factors into each of my scenarios, focusing on low-medium variables to medium-high variables. This ordering was not an attempt to forecast the future. Instead, it allowed me to analyze how different groupings of key variables from each category could influence the projected megatrends.

1. Anthropogenic Emissions of CO₂

In the next 30 years, the effects of climate change on population movements will depend considerably on the world’s ability to reduce greenhouse gas emissions, specifically CO₂. Compared to pre-industrial levels, average global temperatures have increased by approximately 1.0°C.⁶⁷ The IPCC, the U.S. Global Change Research Program, and the scientific community at large generally agree that human activities have

⁶⁶ Intergovernmental Panel on Climate Change, *Climate Change 2014*, 58–60; Allen et al., “Summary for Policymakers”; United Nations, *Report of the Conference of the Parties*; “The Past, Present and Future of Climate Change”; Nansen Initiative, *Global Consultation Conference Report*.

⁶⁷ D. J. Wuebbles et al., eds., *Climate Science Special Report: Fourth National Climate Assessment*, vol. 1 (Washington, DC: Global Change Research Program, 2017), <https://science2017.globalchange.gov/>.

caused this warming.⁶⁸ Fossil fuel combustion for transportation, energy, industry, and more have inundated the atmosphere with CO₂ (along with other greenhouse gases). These trapped gases prevent heat from leaving the Earth, leading to global warming.⁶⁹ If current CO₂ emission rates stay the same, IPCC models project that global warming will continue to increase by approximately 0.2°C per decade. This trend will eventually result in a global mean surface temperature increase of 1.5°C between 2030 and 2052.⁷⁰

On December 12, 2015, 195 nations adopted the Paris Climate Agreement to limit global warming to well below 2.0°C. The agreement requires all signatory countries to substantially reduce their greenhouse gas emissions.⁷¹ Since the adoption of the Paris Climate Agreement, the IPCC recommended that any further warming be limited to no more than a total of 1.5°C, as any increase beyond that would result in irreversible damage to the planet. Loss of ecosystems, an increase in extreme weather events, changes in precipitation patterns, and rising sea levels could all jeopardize low-lying coastal areas and threaten further ocean acidification. To accomplish this, the IPCC proposed radical cuts and net-negative CO₂ emissions (i.e., more CO₂ removed from the atmosphere than released).⁷²

Thus, the next 30 years offer three possible avenues when it comes to anthropogenic emissions of CO₂: 1) business as usual (emissions remain the same), 2) emissions cuts according to the Paris Climate Agreement, or 3) radical cuts and net-negative emissions. In turn, these three pathways will significantly affect the level of climate-induced migration. The warmer the planet gets over the next 30 years, the more likely severe environmental degradation will occur. As a form of adaptation, people may choose to migrate across international borders.

⁶⁸ Allen et al., “Summary for Policymakers,” 4.

⁶⁹ Intergovernmental Panel on Climate Change, *Climate Change 2014*.

⁷⁰ Allen et al., “Summary for Policymakers,” 4.

⁷¹ “What Is the Paris Agreement?,” United Nations Framework Convention on Climate Change, accessed June 23, 2019, <https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement>.

⁷² Allen et al., “Summary for Policymakers.”

2. Slow versus Sudden-Onset Disasters

When considering key variables that might affect climate-induced cross-border migration, bifurcating the types of disasters that could cause displacement is necessary. The types of climatic events will likely correspond with the permanency of human movement. Slow-onset disasters represent long-term environmental degradation that occurs over time (e.g., desertification, rising sea levels, salination of aquifers, and droughts). In contrast, sudden-onset disasters relate to meteorological and geophysical hazards that occur rapidly, including flooding, mudslides, tsunamis, and more. Slow-onset disasters are likely to result in temporary and cyclical migration patterns. As the environment becomes more uninhabitable, these patterns will shift to permanent migration. In contrast, sudden-onset disasters cause large-scale, albeit temporary displacement (see Table 5).⁷³

Table 5. Climate Change–Induced Migration⁷⁴

DISASTER TYPE	EXAMPLES	DISPLACEMENT
Slow-Onset	• Desertification • Rising sea levels • Drought • Salination of freshwater • Ocean acidification	• Temporary and cyclical: People may leave and return home and send money to family staying. • Gradually permanent if the environment becomes uninhabitable
Sudden-Onset	• Hurricane • Flooding • Tsunami • Mudslide	• Large scale, temporary

⁷³ Nansen Initiative, *Global Consultation Conference Report*.

⁷⁴ Adapted from Hugo, “Climate Change-Induced Mobility,” 9–35.

F. SCENARIO DEVELOPMENT

As the last step of the scenario planning process, I combined the previously identified megatrends and key variables into two functional scenarios (see Table 6).

Table 6. Developed Scenarios⁷⁵

	SCENARIO 1	SCENARIO 2
Megatrends	• Climate change • Accelerating technological advancement • Resource stress • Changing power dynamics	• Climate change • Shifting demographics • Economic disparity • Globalization
Variables	• Paris emission cuts and net negative CO₂ emissions (1.5–2.0°C) • Slow-onset disasters	• Some emission cuts, but primarily business as usual (2.0°C or higher) • Combination of slow and sudden-onset disasters

Each scenario is multi-faceted to account for the many interconnected megatrends and variables that could shape the future. Because of the inherent time restrictions of this thesis, I chose to explore only two scenarios versus the four-scenario methodology used by the Royal Dutch Shell Company.⁷⁶

G. INTENDED OUTPUTS

Through the successes of the Royal Dutch Shell Company and the Global Business Network, the practice of scenario planning is incredibly popular within the business world. Yet, its implementation can also have a profound impact on public policy. As explained by Axel Volkery and Teresa Ribeiro, “Scenario planning helps policy-makers making better sense of changes in their external environment, spotting early warning signals and refining perceptions of existing or emerging problems and corresponding problem-solving

⁷⁵ Adapted from Business Monitor International, *Towards 2050*; Hajkowicz, *Global Megatrends*; National Intelligence Council, *Global Trends*; KPMG International, *Future State 2030*; Bughin and Woetzel, “Global Trends”; World Economic Forum, *Global Risks Report 2020*; Intergovernmental Panel on Climate Change, *Climate Change 2014*; Allen et al., “Summary for Policymakers”; United Nations, *Report of the Conference of the Parties*; “The Past, Present and Future of Climate Change”; Nansen Initiative, *Global Consultation Conference Report*.

⁷⁶ Chermack, *Scenario Planning in Organizations*, 144.

strategies.”⁷⁷ By developing two plausible scenarios I can demonstrate the opportunities and threats that cross-border climate-induced migration might pose to the future U.S. homeland security enterprise. In turn, I can use my findings to contribute to the future policy-making process surrounding climate change–induced migration.

⁷⁷ Axel Volkery and Teresa Ribeiro, “Scenario Planning in Public Policy: Understanding Use, Impacts and the Role of Institutional Context Factors,” *Technological Forecasting and Social Change* 76, no. 9 (November 2009): 1, <https://doi.org/10.1016/j.techfore.2009.07.009>.

III. SCENARIO 1: EVERY ACTION HAS AN EQUAL AND OPPOSITE REACTION

There is no such thing as a free lunch.

—Popular adage

In the wake of the 2020 COVID-19 pandemic, the world sees a dip in globalization and overall energy demands. As a result, greenhouse gas emissions also begin to fall as fossil fuel usage decreases. With more people working from home and fewer workers relying on air travel, oil demands continue to drop well into early 2022, as the world anxiously awaits the full deployment of the newly created coronavirus vaccine. At the same time, coal demands have also dropped. Thus, adopting renewables has become far more cost competitive than building brand new fossil fuel plants. Reinvigorated by the decline in greenhouse gas emissions, the international community begins aggressively pursuing non-fossil fuel forms of energy as the cost of borrowing remains low. Mass use of renewables, hydropower, and nuclear energy continues to grow over the coming decades. Governments also begin incorporating geoengineering into their climate-change mitigation strategies. Yet, all actions have an equal and opposite reaction. While humanity may have curtailed global warming to less than 2.0°C compared to pre-industrial levels, decades of uncontrolled use of greenhouse gases have left a mark on the world. As the middle of the 21st century approaches, the lingering effects of climate change, increasing resource stress, the wide use of geoengineering, and renewable energy technology have reshaped geopolitics.

A. THE YEAR 2050

It is a hot and humid day with a distinct smell of raw sewage intermingled with last night's dinner on the breeze. Like so many other camps cropping up worldwide, this one is also full of migrants fleeing flooded coastlines and increased violence in urban centers. This camp, however, is one of the world's largest, housing just over 1.5 million people on the Indian–Bangladesh border (see Figure 4).



Figure 4. Bangladeshi Climate Migrant Camp⁷⁸

The site's proximity to the Indian border has become an increasing point of contention between the two countries. Some within the camp have tried to illegally enter India under the cover of night while others have attempted to claim asylum at the nearest border checkpoint. Few have found success since India's prime minister adopted an increasingly staunch anti-immigration policy. Therefore, most of the migrants continue to sit and wait, with dwindling hopes that their current plight might change for the better.

In one of the seemingly innumerable tents spread throughout the camp, a small group of people gather around an outdated tablet watching a newscast. Trying their best to occupy their time, they watch bemused as the screen shifts from the newest automated Tesla car commercial to an enthusiastic group of world leaders congratulating one another. Behind the women and men, a banner with the emblem of the Nobel Peace Prize shines. In Bengali, the newscaster explains to her captivated audience that the member states of the United Nations Framework on Climate Change have just won the Nobel Peace Prize for their combined effort to reach net-negative CO₂ emissions. Today, December 10, 2050,

⁷⁸ Source: iStock, "Earthquake in Van, Turkey," Center for Homeland Defense and Security Image Collection, accessed August 30, 2020.

the bright-eyed newscaster reports that the international community is celebrating its accomplishment to curtail global mean surface temperature to 1.7°C above pre-industrial levels. As the segment on the 2050 Nobel Peace Prize ends, the reporter remarks that many within the international community credit China specifically for leading the way in the battle against global warming.

1. A Rising Power in the East

China, the news anchor clarifies, is the global leader in non-fossil fuel energy usage, production, and innovation. Much of the world is highly reliant on China, as the principal producer of solar panels and renewable energy storage solutions, for its green energy supply chain. The country has additionally embraced a nuclear renaissance by tripling its atomic capacity over the last 30 years. Although the United States and Europe continue to maintain a small number of nuclear power plants—most are still in France—the countries have primarily shifted to the use of renewables. China has filled the void left by Western nations by becoming the global leader in atomic power. Emerging economies in Africa, South America, and the Middle East have turned to the Asian nation for nuclear fuel and radioactive waste disposal. China's dominance in the energy sector has yielded high profits and greater influence in international affairs by helping other countries develop similar climate-change mitigation strategies. The world relies on China not only for its production, the female reporter adds, but also for its knowledge as well as research and development in the energy sector.

As the leading expert in renewable and atomic energy, China now boasts the world's best universities for energy, research and development, and emerging technology. In an ironic turn of events, the best and brightest American, British and European Union students now come to China—as opposed to Chinese students coming to the United States as in years past—for an education. Many corporations from Silicon Valley have also relocated to China for comparable reasons. As such, economic migration has boomed in China, as more people come to the country in search of better-paying jobs and opportunities. The West now faces serious brain drain, further straining its economies. The balance of power has shifted from the West in favor of the East as more emerging

economies become international powerhouses, especially in China, India, and Indonesia. Such shifts in power, the news announcer quips, have led to new geopolitical tensions, which have been exacerbated by the world's use of unregulated geoengineering technology. At this, the camera pans to a dark-haired newscaster. Behind the man, two Chinese workers tinker with a fuel-burning chamber in the Himalayas (see Figure 5).



Figure 5. Cloud Seeding on the Tibetan Plateau⁷⁹

The chamber, the newscaster goes on to explain, is part of China's contentious Sky River Project.

2. The Sky River

Fully implemented in 2022, the geoengineering project has successfully produced rainfall in the Tibetan Plateau by systematically injecting silver iodide into the clouds. The process, also known as cloud seeding, has supported the growing water demands of the surrounding population. While the country has immensely benefited, China's southern

⁷⁹ Source: Stephen Chen, "China's Building a Rain-Making Network Three Times the Size of Spain," *South China Morning Post*, March 26, 2018, <https://www.scmp.com/news/china/society/article/2138866/china-needs-more-water-so-its-building-rain-making-network-three>.

neighbors have not. The newscast shifts to a video of an explosion on the Sino–Indian border caused by what appears to be drone warfare. The news anchor goes on to describe how the Tibetan Plateau not only serves as a critical water source to China but also to India and much of Southeast Asia. As a result, conflict has erupted, specifically between India and China, with India blaming China’s Sky River Project for the country’s dwindling water supplies and shortened monsoon season.

Over the last 30 years, the Indian population has increased by nearly 270 million people, contributing to an exponential rise in food and water demands. The regional proxy wars and prolonged droughts throughout rural India have forced many citizens to move to major urban centers, contributing to the growing slums of Mumbai, Delhi, and Kolkata. Civil unrest permeates the country, further escalating tensions between China and India. As the images of violence fade from the tablet screen, an Apple commercial takes their place, pitching the company’s newest computer that interfaces with the brain. An upcycle of the Apple Think Different campaign from the late 1990s, the ad quips, “Thinking different just got smarter. Apple iBrain.”

3. Water, Water Everywhere, and Not a Drop to Drink

As the Apple commercial ends, the news broadcast recommences, with a male reporter sharply dressed in a suit standing in front of one of the mega desalination plants located in Saudi Arabia. Just like in Southeast Asia, the announcer explains, water demands have also skyrocketed in the Middle East. As a result, Saudi Arabia, Israel, and the United Arab Emirates (UAE) have become further dependent on the desalination process—as the man gestures behind him to the massive industrial complex. He then points to the huge solar farm to the west of the plant, explaining that the desalinization process remains energy intensive and, for many developing nations, prohibitively expensive.

In Yemen, Syria, and Iraq, water scarcity remains high where governments lack the capital needed to build enough desalination plants to meet the needs of their populations. Consequently, conflicts have erupted as terrorist groups and armed rebels have taken advantage of the situation and weaponized water. The groups continue to leverage access

to water supplies by charging exorbitant fees or as a form of child soldier recruitment among local populations.

The reporter goes on to explain that the violence over water has since spilled over into nearby affluent nations. At this, an image of a newly renovated Jebel Ali desalination plant fills the tablet screen. In May 2049, the broadcaster reminds his audience, a Yemeni terrorist group attacked the UAE desalination plant in Dubai (see Figure 6).



Figure 6. Jebel Ali Desalination Plant⁸⁰

In response, the UAE government counterattacked, killing many innocent Yemeni civilians and displacing even more from their homes and communities with few returning.

⁸⁰ Source: Kelsey D. Atherton, "In Photos: Dubai's Massive Desalination Plant," *Popular Science*, February 17, 2017, <https://www.popsci.com/dubais-desalination-plant-photos/>.

Violence, the reporter explains, not to mention the ill effects of the desalination process, has forced many people to migrate.

Highly concentrated brine, the byproduct of the desalination process, is thrown back into the ocean, killing many organisms that support the marine food chain. Thus, little marine biodiversity now remains in the Red Sea and the Persian Gulf. While some communities have turned to aquaponics in combination with hydroponics to cultivate crops and raise aquatic animals for consumption, others have found themselves forced to migrate in search of work. Many end up in migrant camps interspersed with those displaced by violence and the continued effects of climate change.

Pictures from one such camp fill the tablet screen. The Bangladeshi migrants cannot help but notice how similar the conditions look to their own: cramped quarters, clothes drying in the wind, and children darting in between tents. While this camp may be located thousands of miles away on the Arabian Peninsula, the sunken faces of these migrants look all too familiar.

At this point, the broadcast changes once again, this time to images of cattle grazing against a brilliant blue sky filled with balloons.

4. Tinkering with Mother Earth

A female voice-over explains that the balloons are injecting calcium carbonate and sulfates into the stratosphere to induce a cooling effect. The woman details how the United States has turned to stratospheric solar radiation technology throughout the states of Arizona, New Mexico, and Texas. Mimicking the effects of a volcano, the particles reflect a portion of the sun's rays into space and have helped prevent droughts and prolonged heatwaves in the region. These benefits, however, have not helped the United States' southern neighbor, Mexico. The stratospheric aerosols have altered Mexico's precipitation patterns, resulting in massive crop failures and water scarcity. Many rural Mexicans, therefore, have abandoned their farms and migrated to the nearest cities. Some have chosen to make their way to the U.S. Southern Border, claiming that America's use of the unregulated technology has made them refugees in their own country. The camera pans to an image of the Bridge of the Americas located between Ciudad Juarez and El Paso, Texas.

Massive lines of people, both on foot and in car, wait at the border-crossing check point that separates Mexico from the United States (see Figure 7).



Figure 7. Long Lines at the U.S. Southern Border⁸¹

The news anchor goes on to describe the long waiting times to enter the United States and how few people have the proper documents to enter at all. Those who lack the proper paperwork often claim asylum but are usually stuck permanently in Juarez. Those who can enter and work in the United States end up traveling to the Midwest, where carbon capture sequestration facilities and direct air capture stations dominate the landscape of Missouri, Illinois, Indiana, and Iowa.

The United States, the anchor explains, has also grown progressively dependent on negative emission technology. The carbon dioxide removal techniques have helped the nation significantly decrease its net CO₂ emissions, but at a cost. The biomass crops require large amounts of water and land usage. As such, agricultural production for biomass now

⁸¹ Source: iStock, “US Mexican Border,” Center for Homeland Defense and Security Image Collection, accessed August 30, 2020.

competes with food crops, resulting in higher grocery costs and decreased food exports. Also, many of the facilities have disrupted the environments of natural flora and fauna in the area, leading some scientists to argue that the negatives of the technologies far outweigh the positives. This sentiment is mirrored by many farmers who have lost their property under eminent domain because of the U.S. government's need for more land to build the negative emissions technologies along with wind and solar farms. With the mention of renewables, the broadcast shifts one last time, back to the reporter who had covered the Nobel Peace Prize ceremony. The woman, a smile beaming across her face, congratulates her viewers. Humanity, she says, has successfully prevented the catastrophic effects of runaway global warming. The reporter signs off, and the latest reality show—*Survivor, SpaceX Moon Station Edition*—begins.

The people in the tent look around to one another, a quizzical look on their faces. They know firsthand that the long-term consequences of climate change have not gone away. Global warming still underlies severe weather, droughts, and rising sea levels. With the world's population now over nine billion, these effects only further strain a dwindling supply of food and water. Geoengineering, the world's solution to curtailing uncontrolled climate change, has unintentionally resulted in increased conflict, forcing many populations from their homes. Thus, human migration continues, just as it always has. While their camp on the Indian–Bangladesh border may be one of the world's largest, it represents only a small fraction of the 300 million people now displaced worldwide. These displaced Bangladeshis wonder, if humanity has won the battle against global warming, why do they, and so many others, no longer have a place to call home?

B. THE HERE AND NOW, 2020

Since the coronavirus outbreak in late December 2019, greenhouse gas emissions have decreased. By significantly restricting the way humans travel and interact (e.g., air travel, and commutes), COVID-19 has driven down the demand for both oil and coal. Consequently, greenhouse gas emissions have also dropped. The International Energy Association now predicts that greenhouse gas emissions could be 8 percent less than those

of 2019. Thus, the effects of the virus on fossil fuel demand could drive the world to the greater adoption of renewable energy, as posited by the *Economist*.⁸²

Although fictional, Scenario 1 offers a glimpse into one plausible version of the future based on the interconnecting global megatrends of climate change, technological advancement, resource stress, and changing international power dynamics. These interwoven driving forces are further coupled with an aggressive shift in the world's battle against global warming toward net negative CO₂ emissions in geoengineering and non-fossil fuel energy. While the long-term implications of a post-pandemic world are yet to be seen, many of the fundamental trends that could result in a world like that depicted in Scenario 1 are already in play today.

1. Who Controls the World's Thermostat?

Over the last 250 years, technology has repeatedly reshaped human society. Now entering the fourth Industrial Revolution, the world will witness the advent and impact of artificial intelligence, the internet of things, biotechnology, big data, and more.⁸³ These new forms of technology are likely to have a significant impact on society over the next 30 years, including how humans respond to the effects of climate change. Of crucial importance is the scientific field known as geoengineering, which seeks to counteract climate change by intervening in the Earth's natural systems.⁸⁴ Within the field, two techniques predominate, solar radiation management and carbon dioxide removal. Solar radiation management focuses on counteracting global warming by reflecting the sun's solar energy into space. By comparison, carbon dioxide removal techniques concentrate on the extraction of CO₂ and other greenhouse gas emissions from the atmosphere. Also known as negative emissions technology, carbon dioxide removal includes afforestation, direct air capture, ocean fertilization, biochar, bioenergy with carbon capture and storage

⁸² "Can Covid Help Flatten the Climate Curve?," *Economist*, May 21, 2020, <https://www.economist.com/briefing/2020/05/21/can-covid-help-flatten-the-climate-curve>.

⁸³ Business Monitor International, *Towards 2050*, 7.

⁸⁴ "What Is Geoengineering?," Oxford University Geoengineering Programme, accessed August 30, 2020, <http://www.geoengineering.ox.ac.uk/www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>.

(BECCS), and more.⁸⁵ As the battle against climate change and rising temperatures becomes more daunting, many scientists are calling for the use of geoengineering as a solution.

As part of the 2018 special report by the IPCC, the intergovernmental agency includes the implementation and use of carbon dioxide removal in its findings. Using four different scenarios, the IPCC models the different emission trajectories the world might take to curtail future global warming to 1.5°C. Although none of the assessed scenarios include solar radiation management, the report does acknowledge that the technology could help reduce further global warming.⁸⁶ Heeding the findings of the study and an increasing call from world leaders, many countries have begun pursuing geoengineering as part of their climate-change mitigation strategy. Yet, no international guidance currently exists. Lack of regulation has not, however, prevented countries from using and developing geoengineering throughout the world.

China, for example, is assembling one of the world's largest federally funded geoengineering research and development programs. The research group is exploring climate-change modification, policy, and governance issues surrounding extensive use of the technology.⁸⁷ While the research group is focusing on the general use of geoengineering, China's state-owned Aerospace and Technology Corporation is already running a massive seed clouding project across the Tibetan Plateau. Coined the Sky River Project, the weather modification system involves thousands of rain-inducing machines spread throughout the region. If the project proves successful, it could result in 10 billion

⁸⁵ National Academies of Sciences, Engineering, and Medicine, *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda* (Washington, DC: National Academies Press, 2019), <https://doi.org/10.17226/25259>.

⁸⁶ Allen et al., "Summary for Policymakers," 12–14.

⁸⁷ James Temple, "China Builds One of the World's Largest Geoengineering Research Programs," *MIT Technology Review*, August 2, 2017, <https://www.technologyreview.com/2017/08/02/4291/china-builds-one-of-the-worlds-largest-geoengineering-research-programs/>.

cubic meters of rainfall each year, rainfall diverted from China's southern and southeastern neighbors.⁸⁸

The Tibetan Plateau contains the headwaters of some of the most crucial river basins throughout Asia. The Brahmaputra, Ganges, Indus, Irrawaddy, Mekong, and Salween rivers flow through China into neighboring Bangladesh, India, Laos, Myanmar, Nepal, and Pakistan. As such, the Tibetan region provides water for billions of people throughout the continent, including India.⁸⁹ By 2030, estimates predict that water demand in India is likely to double. This exploding requirement becomes incredibly problematic considering some 600 million Indians are already dealing with extreme water stress. Since 2015, widespread drought-like conditions have ravaged India, including the agriculture sector that heavily relies on monsoon rains for food production.⁹⁰ If deployed at full scale, China's Sky River Project could alter the regional weather patterns, overall climate and possibly suppress precipitation and cloud development.⁹¹ Thus, China's cloud seeding project poses a true risk to India's future water and food supplies. Already considered a regional rival, China's Sky River project could exacerbate tensions between the two countries and erupt in violence. According to the UN, in the year 2018 alone, violence, conflict, human rights violations, and persecution forcibly displaced 70.8 million people worldwide.⁹² Thus, it is easy to envision how many people might be forced from their homes if proxy wars or the like were to erupt between India and China, as imagined in Scenario 1. This potential for conflict over the use of geoengineering, however, will not be

⁸⁸ Trevor Nace, "China Is Launching Weather-Control Machines across an Area the Size of Alaska," *Forbes*, May 10, 2018, <https://www.forbes.com/sites/trevornace/2018/05/10/china-is-launching-a-massive-weather-control-machine-the-size-of-alaska/>.

⁸⁹ Dhanasree Jayaram, "China's Geoengineering Build-up Poses Geopolitical and Security Risks," *Climate Diplomacy*, December 5, 2019, <https://www.climate-diplomacy.org/news/china%E2%80%99s-geoengineering-build-poses-geopolitical-and-security-risks>.

⁹⁰ Edmond Roy, "India's Latest Crisis: 600 Million People Struggle with Drought," *Interpreter*, July 16, 2019, <https://www.lowyinstitute.org/the-interpreter/india-s-latest-crisis-600-million-people-struggle-drought>.

⁹¹ Jayaram, "China's Geoengineering Build-up."

⁹² United Nations High Commissioner for Refugees, *Global Trends: Forced Displacement in 2018* (Geneva: United Nations, 2019), <https://www.unhcr.org/globaltrends2018/>.

limited to Asia; its effects could be felt worldwide based on wide adoption and use of the unregulated technology.

Just like China, the United States and Europe are increasingly investing in geoengineering research and development. Over the last five years, negative emissions technology has increasingly garnered attention in the West as a feasible means to remove CO₂ from the atmosphere and help countries meet the aggressive emissions goals of the Paris Climate Agreement.⁹³ Therefore, the United States and many European countries are progressively investing in the creation of BECCS facilities for electricity.⁹⁴

In its most basic form, BECCS creates energy by burning plant biomass, capturing the CO₂ emitted during combustion, and storing it underground. By storing the CO₂ underground versus releasing it into the atmosphere, BECCS facilities produce net-negative carbon emissions. The geoengineering technology has advanced to using algae and municipal waste to create energy as well.⁹⁵ The implementation of large-scale BECCS and other negative emissions technology could have an immense impact on the battle against global warming, but all carry potential pitfalls.

Currently, afforestation, reforestation, biochar, and BECCS are prohibitively expensive. The technology could also substantially affect the world's food supply chain and environment.⁹⁶ For example, converting grasslands for BECCS could have a

⁹³ Alexandre Köberle and Mathilde Fajardy, "The Ups and Downs of BECCS—Where Do We Stand Today?," Grantham Institute, April 2, 2019, <https://granthaminstitute.com/2019/04/02/the-ups-and-downs-of-beccs-where-do-we-stand-today/>.

⁹⁴ In Norway, the Klemestrud plant uses household and industrial waste to provide heating and power to the city of Oslo's inhabitants. The plant is currently in a testing phase to become a full-scale carbon capture and storage facility this year with plans to store the CO₂ in the North Sea in former Norwegian-owned wells. Outside Orleans, France, a sugar beet refinery captures and stores its CO₂ in the geological formation under the Paris Basin. Finally, in the United States, Decatur, Illinois, serves as the home to the first industrial-scale BECCS facility. As part of its corn to ethanol processing, the Arthur Daniels Midland plant stores the CO₂; it creates 7,000 feet below ground in a geological formation. "First-of-Its-Kind Test Program for Carbon Capture & Storage (CCS) Launched at Klemetsrud," Track My Electricity, accessed June 2, 2020, <http://www.trackmyelectricity.com/news/first-of-its-kind-test-program-for-carbon-capture-storage-ccs-launched-at-klemetsrud/>; Danielle Venton, "Core Concept: Can Bioenergy with Carbon Capture and Storage Make an Impact?," *Proceedings of the National Academy of Sciences of the United States of America* 113, no. 47 (2016): 13260–62, <https://doi.org/10.1073/pnas.1617583113>.

⁹⁵ Venton, "Core Concept."

⁹⁶ National Academies of Sciences, Engineering, and Medicine, *Negative Emissions Technologies*, 400–401.

detrimental effect on preexisting flora and fauna, potentially destroying entire ecosystems.⁹⁷ At the same time, many negative emission technologies require large swaths of land and water, forcing a trade-off between food production and CO₂ reduction. Worldwide, more than 820 million people suffer from hunger. Climate change, conflict, and economic downturns are the leading contributors to these statistics—statistics that take on a grim overtone when contemplating the UN’s prediction that food production will need to increase by 50 percent within the next 30 years.⁹⁸ Therefore, the implementation of negative emissions technology could drive mass population movements in search of food. Outside of negative emissions technology, the United States is also exploring the use of solar radiation management as a way to curb further warming.

The Keutsch Research Group at Harvard University is currently pursuing the world’s first outdoor solar radiation management experiment. The experiment involves the use of two steerable balloons and mimics the cooling effects of a volcanic eruption by injecting calcium carbonate into the stratosphere. Ideally, the particles will reflect a portion of the sun’s rays into space and lead to cooling of the Earth. If the project succeeds, it could herald in the future use of solar radiation management on a nation-wide scale.⁹⁹

At a considerably small cost, solar radiation management offers a viable solution for many countries to alter local temperatures to their benefit. Although the benefits could be many, the geophysical and geopolitical consequences could be far more profound. The unregulated use of the technology could lead to shifts in regional crop growth and

⁹⁷ Paul C. Stoy et al., “Opportunities and Trade-Offs among BECCS and the Food, Water, Energy, Biodiversity, and Social Systems Nexus at Regional Scales,” *BioScience* 68, no. 2 (2018): 106, <https://doi.org/10.1093/biosci/bix145>.

⁹⁸ United Nations Food and Agriculture Organization et al., *The State of Food Security and Nutrition in the World: Safeguarding against Economic Slowdowns and Downturns* (Rome: United Nations, 2019), <https://www.wfp.org/publications/2019-state-food-security-and-nutrition-world-sofi-safeguarding-against-economic>; “Water, Food and Energy,” United Nations Water, accessed June 3, 2020, <https://www.unwater.org/water-facts/water-food-and-energy/>.

⁹⁹ Jeff Tollefson, “First Sun-Dimming Experiment Will Test a Way to Cool Earth,” *Nature* 563, no. 7733 (2018): 613–15, <https://doi.org/10.1038/d41586-018-07533-4>.

precipitation patterns along with possible ozone depletion.¹⁰⁰ Although still experimental, the United States' use of stratospheric aerosols in the Southwest could impact Mexican agriculture, and spur migration. For example, in a 2010 study, researchers found a correlation between climate-driven changes in crop production and Mexican emigration to the United States. Focusing on Mexican state-level data in climate, emigration, and crop yields from 1995 to 2005, Shuaizhang Feng, Alan Krueger, and Michael Oppenheimer found that emigration increases for every 10 percent drop in crop production.¹⁰¹ Thus, while imaginary, Scenario 1 offers a plausible example of how geoengineering could spur Mexicans to migrate to the United States.

With an ever-growing human population and increasing industrialization, many within the scientific community agree that climate-change mitigation strategies must incorporate geoengineering.¹⁰² Yet, little emphasis has been placed on geoengineering standards or international agreements of its usage.¹⁰³ Lacking an international framework to regulate geoengineering, a rogue nation may start using the technology to the disadvantage of neighboring states. If that occurs, proxy wars, armed conflict, and terrorism could result in human displacement and possible mass migration events.

2. Resource Roulette: A Growing Conflict

By the year 2050, the UN estimates the world's population will reach 9.7 billion people.¹⁰⁴ As a result, water, energy, and food demand will increase exponentially.¹⁰⁵

¹⁰⁰ Oliver Geden and Susanne Droege, "The Anticipatory Governance of Solar Radiation Management," Council on Foreign Relations, July 2, 2019, <https://www.cfr.org/report/anticipatory-governance-solar-radiation-management>.

¹⁰¹ Shuaizhang Feng, Alan B. Krueger, and Michael Oppenheimer, "Linkages among Climate Change, Crop Yields and Mexico-US Cross-Border Migration," *Proceedings of the National Academy of Sciences* 107, no. 32 (2010): 14257–62, <https://doi.org/10.1073/pnas.1002632107>.

¹⁰² Fred Pearce, "Geoengineer the Planet? More Scientists Now Say It Must Be an Option," *Yale Environment 360*, May 29, 2019, <https://e360.yale.edu/features/geoengineer-the-planet-more-scientists-now-say-it-must-be-an-option>.

¹⁰³ Geden and Droge, "Governance of Solar Radiation Management."

¹⁰⁴ United Nations Department of Economic and Social Affairs, *World Population Prospects 2019: Highlights* (New York: United Nations, 2019), 5, https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf.

¹⁰⁵ Business Monitor International, *Towards 2050*, 10–11.

Wars over precious resources are not new phenomena. The West's interest in the oil-rich Middle East has long been contested. Many within the U.S. government now acknowledge that access to oil was a key contributor to launching the Iraq War.¹⁰⁶ Blood or conflict diamonds have funded armed rebel movements throughout the Congo and contributed to civil wars in Angola and Sierra Leone, along with human rights abuses.¹⁰⁷ Climate change, coupled with rapid population growth, urbanization, and emerging economies, will have a significant effect on the water–energy–food nexus. The way countries grapple with the rising demand in all three sectors in the next 30 years will likely play an important role in geopolitics and world order. Climate-driven dwindling resources and subsequent shortages, therefore, will force many populations from their homes.

By 2050, the UN predicts that water withdrawals for agriculture and industry will have increased by 55 percent.¹⁰⁸ Put simply, worldwide water demand will outpace that which is available. The effects of climate change will further strain water availability through desertification and widespread drought. Rising sea levels could also result in the salinization of groundwater supplies for coastal cities as more seawater infiltrates aquifers.¹⁰⁹ For some nations, water security is already a growing concern and will likely only get worse.

With limited pre-existing supplies, many countries in the Middle East have turned to desalination plants to meet their water needs. Out of all the desalination plants worldwide, 70 percent lie in the Middle East. Although desalination holds many opportunities, it remains environmentally costly and unattainable for low-income nations. Concentrated brine, one of the by-products of the desalination process, is frequently dumped back into the sea, where it wreaks havoc on marine biology. Additionally, the

¹⁰⁶ Aryn Baker, "Why the Blood Diamond Trade Won't Die," *Time*, accessed June 3, 2020, <https://time.com/blood-diamonds/>.

¹⁰⁷ Baker.

¹⁰⁸ United Nations Water, "Water, Food and Energy."

¹⁰⁹ Nick Bradford, "Groundwater and the Rising Seas," National Environmental Education Foundation, accessed June 3, 2020, <https://www.neefusa.org/nature/water/groundwater-and-rising-seas>.

desalination process is extremely energy-intensive and therefore, expensive.¹¹⁰ If countries within these regions cannot afford desalination to meet their citizens' needs, the countries' water, energy, and food demands will likely become unsustainable. As discussed in the literature review, a prolonged drought from 2006 to 2011 in Syria likely contributed to the country's ongoing civil war and eventually led to climate-induced migration throughout the country.¹¹¹

Although water may be a necessity of human life, most of it goes toward industry and agriculture, not municipal use. Agriculture, by far, is the largest consumer of water, with 69 percent of all withdrawals going toward livestock, irrigation, and aquaculture. Industry accounts for 19 percent of all global water use, and of that amount, 75 percent goes toward energy production.¹¹² Water, therefore, is not just for consumption. Instead, it plays an interconnected role in the way humans produce food and industrialize their nations. As demands for all three go up in the future, water security could become a serious point of contention. Such conflict is already occurring in the state of Syria. The Islamic State of Iraq and Syria (ISIS) has weaponized water by controlling access to water supplies, contaminating sources, flooding areas, and capturing dams on the Euphrates and Tigris rivers. Using water to support their political aims, terrorist groups have also affected agriculture and energy. When ISIS temporarily took control of the Mosul Dam, it disrupted Iraq's energy supplies as the dam used hydropower to generate electricity. By weaponizing water, ISIS gained territory and displaced many within the region.¹¹³ Coupled with the ongoing civil war, ISIS has significantly contributed to the ongoing Syrian refugee crisis. Its weaponization of water, therefore, offers a salient example of how terrorists and other armed groups may capitalize on the continued effects of climate change. Although some

¹¹⁰ Henry Fountain and Jamie McGregor Smith, "The World Can Make More Water from the Sea, but at What Cost?," *New York Times*, October 22, 2019, <https://www.nytimes.com/2019/10/22/climate/desalination-water-climate-change.html>.

¹¹¹ Gleick, "Water, Drought, Climate Change, and Conflict in Syria."

¹¹² United Nations Water, "Water, Food and Energy."

¹¹³ Tobias von Lossow, "The Rebirth of Water as a Weapon: IS in Syria and Iraq," *International Spectator* 51, no. 3 (2016): 82–99, <https://doi.org/10.1080/03932729.2016.1213063>.

may choose to weaponize the future water–energy–food nexus to their advantage, others will use it for economic gain.

The Chinese government is aggressively setting itself up to be the future world leader in renewables and nuclear energy, not to mention hydropower. China leads in renewables, with one-third of the world's installed capacity. It also owns 72 percent of solar module production. Such production in the United States and Europe remains comparatively low. China also leads in the mining of lithium and, consequently, the production of lithium-ion batteries used in numerous forms of technology, ranging from laptops to electric vehicles.¹¹⁴ China's ambitions encompass not only renewable energy but also nuclear power, for a more diversified energy portfolio. Since 2010, China has grown its nuclear capacity, intending to double its nuclear output to 130 gigawatts over the next 10 years.¹¹⁵ The Asian nation has 12 reactors currently under construction, with another 42 units in the works. If China's ambitious plan goes accordingly, it will become the second greatest producer of nuclear power, outranking France in under two years. If the country continues this trend, it will overtake the United States in atomic power production by 2030.

As more countries turn away from nuclear power in favor of renewables following the 2011 Fukushima nuclear accident, China has a prime opportunity to take over as an international leader in the atomic energy field. Of course, many drawbacks remain within the industry, the greatest being safety and the disposal of radioactive waste, but this has yet to deter China's plans to become a global leader in energy and decrease its dependence on coal.¹¹⁶ China's plan to monopolize the energy industry will likely garner much economic migration to the country. The country is actively recruiting international scientists and

¹¹⁴ Francois Austin and Oliver Wyman, "The Future of Energy Is Being Shaped in Asia," World Economic Forum, December 27, 2019, <https://www.weforum.org/agenda/2019/12/the-future-of-energy-transition-climate-asia-china-india/>.

¹¹⁵ "China to Dominate Nuclear as Beijing Bets on Homegrown Reactors," Bloomberg Green, June 1, 2020, <https://www.bloomberg.com/news/articles/2020-06-01/china-to-dominate-nuclear-as-beijing-bets-on-homegrown-reactors>.

¹¹⁶ James Griffiths, "China's Gambling on a Nuclear Future, but Is It Destined to Lose?," CNN, September 13, 2019, <https://www.cnn.com/2019/09/13/business/china-nuclear-climate-intl-hnk/index.html>.

engineers as part of the Thousand Talents program. Although not currently considered a prime destination for economic migration because of political and social barriers, the future economic opportunities China holds could entice migrants, including Westerners.¹¹⁷ If such a future world comes to fruition, China's grip on international power will likely grow.

3. A New World Order

Over the next three decades, emerging markets will shift the global economy in favor of the East and South. According to the sixth edition of the United Kingdom's report on *Global Strategic Trends*, "By 2050, the combined size of the Emerging 7 (E7) economies (Brazil, China, India, Indonesia, Mexico, Russia, and Turkey) are likely to have surpassed the Group of Seven (G7) (Canada, France, Germany, Italy, Japan, the United Kingdom (UK) and the United States)."¹¹⁸ In turn, this change in the global market will likely affect the balance of power. The yesteryears of a unipolar world order led by the United States will cede to a multipolar international system. As more nations improve their economic status and material claims, their interests will play an increasingly greater role in geopolitics. In Asia, for example, China and India continue to build their military and political power to rival that of the United States, which could influence the future balance of power.¹¹⁹ As a result, it will become progressively more difficult to achieve international cooperation and governance agreements.

Today, many international frameworks exist regarding climate change. Yet, resistance often remains high with some nations later choosing to abandon the initiatives. Take, for example, the international adoption of the monumental 2016 Paris Agreement. The world collectively agreed to reduce emissions of greenhouse gases, but in 2018, the National Oceanic Atmospheric Administration documented the fourth-highest atmospheric

¹¹⁷ Remco Zwetsloot and Dahlia Peterson, "The US-China Tech Wars: China's Immigration Disadvantage," *Diplomat*, December 31, 2019, <http://thediplomat.com/2019/12/the-us-china-tech-wars-chinas-immigration-disadvantage/>.

¹¹⁸ United Kingdom Ministry of Defence, *Global Strategic Trends*, 84.

¹¹⁹ United Kingdom Ministry of Defence, 11.

concentration of carbon dioxide on record.¹²⁰ Support for the agreement has also waned in years since its adoption. On June 1, 2017, President Trump announced his intention for the United States to leave the Paris Agreement in 2020, claiming that the agreement puts unfair financial and economic burdens on the United States in comparison to other major polluters such as China and India.¹²¹ When the United Nations Environment Assembly met in Nairobi, Kenya, to assess the usage and regulations of geoengineering in March 2019, the meeting ended with a lack of consensus among nations. Ultimately, the United States and Saudi Arabia insisted that any international assessment of geoengineering should come from the IPCC as part of its sixth assessment report in 2021.¹²²

As more countries gain power, international agreements could become even harder to achieve. Thus, it is entirely plausible that countries will move away from international negotiations in favor of their own interests. As evidenced in Scenario 1, it is still plausible, however, that the world could keep global warming below 2.0°C. Such a future will likely include the use of geoengineering. Sans regulations, the technology could result in many unintended consequences, including human displacement. Thus, the coming years are incredibly important in terms of U.S. planning. If the United States hopes to curb climate-induced migration and other forms of human displacement, it must start preparing now.

C. THE BIG PICTURE

Although Scenario 1 is technically hypothetical, such a future is not outside the realm of possibility. The contemplation of such a future offers many conclusions that could help or hinder the mission of DHS and other U.S. security-driven agencies.

¹²⁰ “Global Carbon Dioxide Growth in 2018 Reached 4th Highest on Record,” National Oceanic and Atmospheric Administration, March 22, 2019, <https://www.noaa.gov/news/global-carbon-dioxide-growth-in-2018-reached-4th-highest-on-record>.

¹²¹ Chris Mooney, “Trump Withdrew from the Paris Climate Deal a Year Ago. Here’s What Has Changed,” *Washington Post*, June 1, 2018, <https://www.washingtonpost.com/news/energy-environment/wp/2018/06/01/trump-withdrew-from-the-paris-climate-plan-a-year-ago-heres-what-has-changed/>.

¹²² Jean Chemnick, “U.S. Blocks U.N. Resolution on Geoengineering,” *Scientific American*, March 15, 2019, <https://www.scientificamerican.com/article/u-s-blocks-u-n-resolution-on-geoengineering/>.

1. Migration Will Continue

No matter how the world tackles the challenge of global warming, migration will continue, including climate change–induced migration. The wide adoption of geoengineering technology along with a diversified non–fossil fuel energy profile will not eliminate the effects of climate change. Today, the world sits at 1.0°C warmer than temperatures recorded before the industrial revolution. Even at 1.7°C, as posited in Scenario 1, the world will still have to deal with the effects of climate change. As such, worldwide resources of food and water will continue to grow along with an increasing energy demand. If urbanization and population growth continue, access to water and food will become a growing issue. Civil war, violence, and exploitation of resources could lead to increasing human displacement and subsequent migration.

Additionally, severe weather, rising sea levels, drought, and more will still occur, but likely to a lesser degree than if the world exceeded global temperatures of 2.0°C. Thus, climate migration is still likely to occur. Finally, curbing global temperatures to less than 2.0°C will most likely require the use of geoengineering coupled with green energy solutions. The use of such technology is also highly likely to drive future migration if and when it sparks conflict between neighboring countries over basic resources.

2. Geoengineering, a Pandora’s Box

Geoengineering offers a feasible solution to curb global warming, but its use holds serious concerns. Conflicts could result if a rogue nation’s use of the technology endangers the livelihood of neighboring countries. Additionally, geoengineering is not a binary solution. Using or not using the technology will not save the world from the ill-effects of climate change. The uncontrolled use of solar radiation management, seed clouding, desalinization, and many more processes also have the potential to increase regional and international conflict over dwindling natural resources. In the case of Scenario 1, China’s use of seed-clouding technology limits water resources in neighboring countries. Considering India’s path to exponential population growth in the coming decades, a lack of water could cause proxy wars in the region. If violence occurs, human displacement is

likely to follow. Whether the displaced will meet the definition of refugees greatly depends on the context of the conflict.

As the law is currently written, U.S. asylum seekers must continue to demonstrate they have a “well-founded fear of persecution on account of race, religion, nationality, membership in a particular social group, or political opinion.”¹²³ In 2018, immigration judges rejected 65 percent of asylum cases. Of the 42,224 asylum cases processed in 2018, many claims were based on gang-related and domestic violence. Both are difficult for asylum seekers to establish credible fear based on current immigration language.¹²⁴ Violence and conflict-induced migration are multiclausal. Therefore, future human displacement based on the ill-effects of unregulated geoengineering could have serious implications on the DHS mission of securing U.S. borders and approaches. Just like we have seen in the past, the United States has a long history of ill-preparedness to handle mass migration events.

3. History Does Not Dictate the Future

The West cannot rely on history as an indicator of its future international dominance. The United States’ grip on international power is tenuous at best. Emerging markets, such as India, China, Brazil, Indonesia, Mexico, Russia, and Turkey, will result in a multipolar global order. DHS must assess scenarios in which the United States has decreased international power. A significant portion of DHS’s mission presumes that people will continue to immigrate to the United States. As more countries industrialize and increase their gross domestic product (GDP), these same populations may find it far more enticing to remain within their nations or seek out their fortunes in other emerging economies. If China monopolizes the research and development and an educational market for technology, renewables, and non-fossil fuel energy, the best and brightest, including

¹²³ Immigration and Nationality Act, 8 U.S.C. § 1101(a)(42)(B) (1980).

¹²⁴ Kate Smith, “Asylum Denials Hit Record-High in 2018 as Trump Administration Tightens Immigration Policy,” CBS News, December 4, 2018, <https://www.cbsnews.com/news/asylum-seekers-asylum-denials-hit-record-high-in-2018-as-trump-administration-tightens-immigration-policy-as-the-caravan-arrives/>.

U.S. citizens, may well choose to migrate to the East rather than the West. Thus, brain drain could result in the United States.

4. The Encroaching Dragon

China is currently on a trajectory to be the leader of the non-fossil fuel energy industry. This fact could have significant consequences for the future of U.S. GDP, and possibly the country's role in the future balance of power. As it stands now, China controls the supply chain for solar energy, lithium batteries, and lithium mining. The United States will likely continue to embrace renewable energy. Thus, the United States will remain dependent on China for its supply chain. Additionally, China is not limiting its ambitions to become a global superpower in the energy industry. Although not discussed in the above scenario, China's Road and Belt Initiative, along with the country's artificial intelligence strategy, has serious ramifications when it comes to China's desirability as a location for economic migration.¹²⁵ China's aggressive research and development in technology, energy, and massive global infrastructure investments could entice Americans to abandon the United States in favor of economic opportunity. If future American generations choose to immigrate to China or other emerging economies, this brain drain could further affect U.S. GDP. More importantly, such changes would represent a shift in the world order.

5. Moving Forward

Scenario 1 illustrates a plausible version of the future, where humanity curbs runaway global warming—yet, in turn, must deal with new and unexpected consequences. Through the analysis of Scenario 1, key government decisionmakers can identify future threats and opportunities that might face the United States in the future. Moreover, a variety of policy options and recommendations can be developed and incorporated into the strategic plans of U.S. federal agencies, especially DHS. In the case of Scenario 1, decisionmakers might focus on the unintended results of geoengineering, increased

¹²⁵ Andrew Chatzky and James McBride, "China's Massive Belt and Road Initiative," Council on Foreign Relations, January 28, 2020, <https://www.cfr.org/backgrounders/chinas-massive-belt-and-road-initiative>; Fabian Westerheide, "China—The First Artificial Intelligence Superpower," *Forbes*, January 14, 2020, <https://www.forbes.com/sites/cognitiveworld/2020/01/14/china-artificial-intelligence-superpower/>.

migration driven by climate change and geopolitics, the growing power of China, and consequently, the decreased power of the United States in the future.

While Scenario 1 offers a macro perspective of the world in the year 2050, Scenario 2 explores a future from a distinctively U.S. perspective, a scenario in which U.S. borders, climate migration, and the country's economic resilience intertwine into a different, but plausible, version of the year 2050.

IV. SCENARIO 2: AN OPPORTUNITY

The more things change, the more they stay the same.

—Jean-Baptiste Alphonse Karr

As worldwide energy demands exponentially increase, the allure of fossil fuel reigns supreme for many countries throughout the 2020s. Although, renewable energy and negative emissions technology continue to gain in popularity throughout the world, the adoption and implementation of both are not nearly enough to achieve the lofty goals set by the IPCC and the Paris Agreement. Thus, by the year 2031, global temperatures are 1.5°C warmer than pre-industrial levels. As a result, the severity of climatic events increases worldwide. By 2039, the same year that global temperatures peak to 2.0°C, nearly all nations suffer from the destructive effects of climate change. Unprecedented droughts, massive forest fires, cataclysmic hurricanes, and increasingly severe weather plague much of the world. The once vehement deniers of climate change now find it increasingly difficult to defend their positions as cities like Washington, DC, Jakarta, and Bangkok lose increasing portions of their coastlines to rising sea levels throughout the 2040s. As the severity of damage and loss of human life increase, calls for geoengineering and strict limits to fossil fuels ring across the globe. Yet, many of these calls are too little and far too late. The world is well on its way to breaking the 2.5°C threshold by mid-century, if not sooner.

A. THE YEAR 2050

On August 10, 2050, a tropical storm begins forming in the Lesser Antilles of the Caribbean Islands. As the storm gains speed, it moves westward, eventually turning into a category five hurricane. Meteorologists name the hurricane Rodrigo and expect the storm to hit Puerto Rico around mid-afternoon the next day. Rather than remaining on the trajectory, the hurricane unexpectedly veers northwest, gaining further momentum as it heads towards Haiti. In the early evening of August 12, Rodrigo breaks the highest recorded wind speed of 211 mph. With little forewarning, the Haitian government and its

citizens brace for impact. The hurricane decimates Haiti's Tiburon Peninsula, which had already been suffering from a dilapidated infrastructure. The immense flooding and massive storm surge wash out what few roads exist while leveling homes and buildings. Residing in the poorest country in the Western hemisphere, many Haitians have little to no means of withstanding the destruction of Hurricane Rodrigo. At the same time, the Haitian government with its limited resources struggles to coordinate emergency responders and services to the populations located throughout the peninsula. As Haitians begin to look for their missing and account for the growing number of fatalities, Hurricane Rodrigo continues its path to the Bahamas (see Figure 8).



Figure 8. Hurricane Rodrigo¹²⁶

By the time Hurricane Rodrigo reaches the Bahamian archipelago on the morning of August 13, its wind speeds have increased to 223 mph. Although some Bahamians move inland, many do not have the means or ability to relocate with such short notice. Out of the

¹²⁶ Source: Joshua Stevens, "Hurricane Matthew Hits Haiti," National Aeronautics and Space Administration, October 5, 2006, <https://earthobservatory.nasa.gov/images/88870/hurricane-matthew-hits-haiti>.

archipelago, the islands of Abaco and Grand Bahama are the hardest hit. The storm surge sweeps away homes along with many of the people huddling inside them. Many of the famous reef beds not already destroyed by ocean acidification are toppled by the powerful waves produced by the hurricane. Just like in Haiti, Rodrigo leaves vast destruction and damage in its wake as it heads for the Floridian city of Miami.

1. Reality Sets In

Although the world had attempted to limit global warming to less than 2.0°C, the attraction of economic growth and industrialization won out overall. As such, global temperatures are now 2.6°C warmer than pre-industrial levels. In the last 30 years, the world has seen vast species extinction and severe environmental degradation. Glaciers' have melted so much that permafrost has begun thawing, emitting large levels of methane into the atmosphere, further driving global warming. The future that scientists had warned of has now come to fruition, and the most vulnerable suffer as a result.

In the Western Hemisphere, the Caribbean Islands have withstood the worst of the deleterious effects of climate change. Well before Hurricane Rodrigo, the Bahamian and Haitian governments had struggled to deal with the consequences of a warming world. In the Bahamas, rising sea levels have resulted in the contamination of water supplies as saltwater intrudes into groundwater and aquifers. With little room to move inland, some Bahamians have abandoned the archipelago's smallest islands for larger islands like Andros and Great Inagua. However, reallocation offers little economic opportunity. Ocean acidification and coastal erosion have decimated the once-thriving tourism and aquaculture industries, leaving many in the throes of poverty. A similar situation pervades in Haiti, where constant flooding and subsequent landslides affect housing and employment. While flooding oversaturates the coast, cyclical patterns of drought plague the agricultural industry. Thus, an increasing amount of food must be exported to the nations at an exorbitant cost. While the Caribbean Islands have seen some of the greatest damage, neighboring countries have also grappled to deal with the effects of climate change and a complicated world.



Figure 9. Rising Sea Levels in Haiti¹²⁷

2. Greying Around the Edges

As with the Caribbean economy, the U.S. economy has also waned, because of climate change and a dwindling working-age population. By the year 2050, one out of four Americans are 65 years or older. As the population has grown older, the demand for social services and healthcare have proportionally risen. Nevertheless, critical job shortages exist within both sectors.

Simply put, the U.S. government lacks the workforce and capital to meet the needs of its growing elderly population. Climate change has also left its mark on the nation. In the Southwest, multi-year droughts have ravaged the land, and fire seasons have increased. Severe flooding has made it increasingly difficult to grow crops throughout the Midwest, especially in parts of Nebraska and Iowa. On the coasts, many communities must now deal with rising sea levels, increasing severe weather and the accompanying results of both.

¹²⁷ Source: Logan Abassi, "Hurricane Sandy Causes Heavy Rains and Floods in Haiti," United Nations, October 25, 2012, <https://www.unmultimedia.org/photo/>.

Thus, when Hurricane Rodrigo reaches the shores of Miami on August 13 at mid-afternoon, the city has already been struggling to adapt to the effects of climate change.

When Hurricane Rodrigo hits Miami many of the famous downtown high-rise buildings and luxury condominiums succumb to the unprecedented windspeeds. Those that remain standing are but a former shell of themselves, leaving the Miami skyline an eerie spectacle. By the time the hurricane wanes into a tropical depression outside of South Carolina, Rodrigo has caused hundreds of billions of dollars' worth of damage. In terms of lives lost, both the islands and the city of Miami are reporting tens of thousands of deaths, with the number expected to grow over the coming weeks. As the world watches in disbelief, many politicians and scientists attempt to blame one another for the mass destruction left by the hurricane. The group argues that Hurricane Rodrigo is one more example of the world's inability to curb global warming, as once promised by the international community.

3. The Aftereffects

On August 20, the first Bahamian familial units begin arriving on the shores of Miami seeking asylum, claiming that the recent destruction from Hurricane Rodrigo coupled with the long-term damage of rising sea levels, flooding, and droughts has made their nation uninhabitable. Although the Coast Guard, and CBP's Miami Air and Marine Branch initially intercept and turn around many of the vessels, the situation soon becomes unmanageable. Just as the situation spins out of control in Miami, numerous Haitians also start to sail to Puerto Rico in hopes of claiming asylum. With far fewer staff and facilities than the U.S. mainland, CBP and ICE in Puerto Rico are quickly overwhelmed by the Haitian asylum seekers. As such, many of the migrants enter the island undetected.

Further compounding the situation, confusion abounds among DHS agencies about whether the migrants can be returned if they face harm or possible death in their home countries. Although DHS once contemplated such a scenario, no plan was made. The United States instead chose to rely on the adoption of an international framework to address how countries should handle climate migrants and whether they should be considered

refugees. Thus, with no preparedness plan to handle such an event, the federal government, along with state and local forces, struggles to contain the growing crisis.

Finally, after weeks of chaos, DHS issues an emergency mandate to CBP, allowing all Bahamian and Haitian vessels to land on U.S. soil. Once on land, DHS instructs CBP to apprehend all on board and separate children if accompanying their families. By August 23, CBP facilities and ICE detention centers are at maximum capacity in Puerto Rico. In Miami, few CBP and ICE facilities remain standing because of the significant damage caused by Rodrigo. Therefore, many detainees are kept in makeshift camps (see Figure 10).



Figure 10. Makeshift Detention Facilities in Miami¹²⁸

With each passing day, public outcry and nationwide demonstrations increase over the inadequate housing and inhumane treatment of the asylum seekers.

¹²⁸ Source: Department of Homeland Security Office of the Inspector General, *Management Alert: DHS Needs to Address Dangerous Overcrowding and Prolonged Detention of Children and Adults in the Rio Grande Valley (Redacted)*, OIG-19-51 (Washington, DC: Department of Homeland Security, 2019), 4, https://www.oig.dhs.gov/sites/default/files/assets/2019-07/OIG-19-51-Jul19_.pdf.

4. A Regional Realization

With growing concern for their citizens, Bahamian and Haitian governmental leaders reach out to the U.S. presidential administration in hopes of reaching a regional agreement that benefits the three nations. After months of debate, the president issues an executive order at the end of October 2050, allowing all currently detained Haitians and Bahamians in U.S. custody to apply for a temporary employment visa. The newly created policy allows individuals to live and work in the United States until their countries of origin are once again habitable. Many within the group eventually end up filling critical job shortages in health and elderly care. The larger working force and tax base are already showing signs of helping the United States regrow its economy. By the beginning of 2051, discussions abound within the House of Representatives about a possible bipartisan bill to expand the program to all Caribbean island nations. Coined the Caribbean Environmental Employment Act, the bill calls for the creation of a non-immigrant employment visa. If enacted, the new immigration law would allow Caribbean islanders to temporarily work and live in the country with an eventual path to lawful permanent residency after five years. Although Congress has yet to vote on the bill, a once dire situation has turned into an unexpected opportunity for regional cooperation between the United States and Caribbean nations.

B. THE HERE AND NOW, 2020

Scenario II offers a plausible example of how the future might look in the year 2050. This fictional narrative revolves around the question of how climate change–induced migration might look in 2050 if global warming exceeds 2.0°C. Although the International Energy Association predicts that renewables will provide 50 percent of energy needs by 2040, it also projects that fossil fuels will still provide 35 percent of the demand.¹²⁹ By 2050, the agency also projects that energy demands will grow by approximately 50

¹²⁹ Pippa Stevens, “Global Energy Demand Means the World Will Keep Burning Fossil Fuels, International Energy Agency Warns,” CNBC, November 13, 2019, <https://www.cnbc.com/2019/11/12/global-energy-demand-will-keep-world-burning-fossil-fuels-agency-says.html>.

percent.¹³⁰ If such predictions prove true, limiting global warming to 2°C will become increasingly more difficult, if not impossible. Thus, the effects of climate change are likely to grow even more severe with each decimal of temperature growth.

Although imaginary, Hurricane Rodrigo offers a conceptual illustration of a sudden-onset disaster because of increasing global temperatures. In contrast, rising sea levels, droughts, flooding, and salinized water supplies demonstrate slow-onset disasters. Combined, sudden and slow-onset disasters could easily spur a mass exodus of Caribbean islanders to flee to the United States. Even now, in the year 2020, driving forces are already intersecting that will add further complexity to how the future unfolds within the United States and other nations.

1. The Third Border of the United States

The Caribbean Islands, also referred to as the West Indies, are a group of islands stretching southeast of North America to the northwest of South America (see Figure 11).

¹³⁰ “EIA Projects Nearly 50% Increase in World Energy Usage by 2050, Led by Growth in Asia,” Energy Information Administration, accessed June 4, 2020, <https://www.eia.gov/todayinenergy/detail.php?id=41433>.



Figure 11. Map of the Caribbean Islands¹³¹

The archipelago comprises three groups: the Bahamas, the Greater Antilles, and the Lesser Antilles.¹³² According to the UN's 2019 *World Population Prospects*, an estimated 43 million people live in the Caribbean region.¹³³ The Caribbean Islands, like other small islands, are especially sensitive to climate change due to three interrelated factors: 1) low-lying coastal areas, 2) agriculture and tourist-based economies, and 3) pervasive poverty.¹³⁴ Most infrastructure and development, along with areas of higher population density, are located along the coastlines of the Caribbean Islands. These coastal areas are particularly vulnerable to increasing sea levels, storm and wave surges, and severe weather

¹³¹ Source: *Philip's Encyclopedia*, s.v. "West Indies," accessed August 30, 2020, Credo Reference.

¹³² Paul Lagasse, "West Indies," in *The Columbia Encyclopedia*, 8th ed. (New York: Columbia University Press, 2018), Credo Reference.

¹³³ United Nations Department of Economic and Social Affairs, *World Population Prospects*.

¹³⁴ United Nations, *Small Island Developing States in Numbers*; Organisation for Economic Co-operation and Development, "Special Feature: The Caribbean Small States," in *Latin American Economic Outlook 2019: Development in Transition* (Paris: Organisation for Economic Co-operation and Development, 2019), 186, <https://www.oecd.org/publications/latin-american-economic-outlook-20725140.htm>.

events such as hurricanes and cyclones.¹³⁵ Also, the overall GDP of Caribbean economies relies heavily on the fishing and tourism industries.¹³⁶ Sea level rise, ocean acidification, storm surges, and coral bleaching are likely to have a significant negative impact on both sectors. Finally, within the Caribbean small states, an estimated 20 percent of people live below the poverty line.¹³⁷ According to the UN Council on Human Rights, climate change will have a disproportionate effect on the poorest and most marginalized of people because many will lack the means to adapt to the changing environment.¹³⁸ As a result, some Caribbean islanders may choose to migrate as a form of adaptation, possibly to the United States.

Considering the relative proximity of the Caribbean Islands to the United States, Caribbean citizens are highly likely to flee to the United States to escape the effects of climate change. Out of the 44.5 million immigrants (i.e., individuals who were not U.S. citizens at the time of birth) living in the United States in the year 2017, 10 percent were from the Caribbean.¹³⁹ Out of this group, more than 90 percent were from Cuba, the Dominican Republic, Jamaica, Haiti, and Trinidad and Tobago.¹⁴⁰ The significance of these statistics is that a strong pre-existing population of Caribbean immigrants already reside in the United States, the largest proportions of whom are found in Florida and New York.¹⁴¹ Thus, if extreme climate change were to force the citizens of the Caribbean

¹³⁵ L. A. Nurse et al., “Small Islands,” in *Climate Change 2014: Impacts, Adaptation, and Vulnerability*, Part B: Regional Aspects, ed. Barros et al. (Cambridge: Cambridge University Press, 2014), 1613–54, <https://hal.archives-ouvertes.fr/hal-01090732/document>.

¹³⁶ United Nations, *Small Island Developing States in Numbers*, 15.

¹³⁷ The Caribbean small states include Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago. Organisation for Economic Co-operation and Development, “Caribbean Small States.”

¹³⁸ United Nations Office of the High Commissioner for Human Rights, *Understanding Human Rights and Climate Change* (New York: United Nations, 2015), <https://www.ohchr.org/EN/Issues/HRAndClimateChange/Pages/HRClimateChangeIndex.aspx>.

¹³⁹ Jie Zong and Jeanne Batalova, *Caribbean Immigrants in the United States* (Washington, DC: Migration Policy Institute, 2019), <https://www.migrationpolicy.org/article/caribbean-immigrants-united-states>.

¹⁴⁰ Zong and Batalova.

¹⁴¹ Zong and Batalova.

Islands to flee their home countries, the United States would represent a logical destination for many.

Research has also shown that when choosing to migrate to another country, a person considers not only economics but also existing ethnic enclaves, a similar culture, and language similar to her own.¹⁴² With Caribbean immigrant communities and neighborhoods spread throughout the United States, climate-induced migrants may be more inclined to choose America versus countries in the surrounding region such as Venezuela, Colombia, or others in Central America. The United States also recognizes the importance of the Caribbean Islands in the context of the country's national security and border control.

The 2020 U.S.–Caribbean report to Congress recognizes the Caribbean as “the United States’ ‘third border,’” and the regional proximity of the islands poses a significant threat to the security of the United States.¹⁴³ CBP has multiple branches dedicated to border security within the region focused on the detection, deterrence, and interdiction of drugs, weapons, human smuggling, and terrorist-related activity.¹⁴⁴ At a regional level, the United States also works with many Caribbean nations to enhance the safety and security of the islands. Launched in 2010, the Caribbean Basin Security Initiative has advanced its mission “to reduce illicit trafficking in the region, increase citizen security, and promote crime prevention.”¹⁴⁵ The initiative, however, focuses primarily on crime deterrence and law enforcement building along with border, maritime, and aerial security.¹⁴⁶

As illustrated in this section, therefore, the Caribbean Islands are highly vulnerable to the ongoing effects of climate change. In turn, the island nations’ proximity to the United

¹⁴² Alicia Adserà, “Language and Culture as Drivers of Migration,” IZA World of Labor, July 1, 2015, <https://doi.org/10.15185/izawol.164>.

¹⁴³ “Caribbean Basin Security Initiative,” Department of State, accessed March 8, 2020, <https://www.state.gov/caribbean-basin-security-initiative/>.

¹⁴⁴ “Air and Marine Operations Operating Locations,” Customs and Border Protection, accessed July 12, 2020, <https://www.cbp.gov/border-security/air-sea/oam-operating-locations>.

¹⁴⁵ Department of State, “Caribbean Basin Security Initiative.”

¹⁴⁶ Department of State.

States and existing communities make the country a likely destination for migration. Additionally, DHS recognizes the region as important to the security of the United States. Yet, no current DHS plan addresses this growing threat. Thus, we must ask, if climatic-displaced Caribbean residents choose to come to the United States, will they be allowed to enter? As U.S. history has demonstrated, the country's borders and the overall U.S. immigration system are ill-equipped to handle such mass migrations.

2. Mass Migration

Throughout its history, the United States has witnessed numerous mass migrations. These mass population movements have included not only immigrants but also internally displaced U.S. citizens. Analyzing the case studies of the Mariel boatlift, the migration of Puerto Ricans to the U.S. mainland after Hurricane Maria, and the 2019 U.S. Southern Border crisis reveals a continuous pattern of ill-preparedness to handle mass migration events over the last 50 years.

From May to September 1980, over 125,000 Cubans arrived in Key West, Florida. As political dissidents of the Fidel Castro regime, the migrants came to the United States seeking political asylum. The migrants traveled 90 nautical miles between Cuba and Florida by boats, flotillas, and any other necessary means to reach the shores of the United States.¹⁴⁷ Within this group were approximately 2,000 violent criminals and 23,000 other prisoners convicted of crimes ranging from political dissonance to non-felonious offenses. Ultimately, many of the refugees made their way to Miami, Florida. The city was utterly unprepared to handle the diverse needs of the groups when it came to public services and employment.¹⁴⁸ The incident eventually became known as the Mariel boatlift. Since their arrival, Marielitos have had a distinct impact on Miami-Dade culture and the city's workforce. U.S. immigration policy also changed with the creation of the 1980 Cuban Haitian Entrant Act, which allowed the refugees to adjust status and obtain lawful

¹⁴⁷ Justin García, "Mariel Boatlift," in *Multicultural America: A Multimedia Encyclopedia* (Thousand Oaks: SAGE Publications, 2013), <https://doi.org/10.4135/9781452276274>.

¹⁴⁸ García.

permanent residency in the United States.¹⁴⁹ While political dissent against the Castro regime spurred the Mariel boatlift, such has not been the case for the more recent migration of Puerto Ricans to the U.S. mainland following Hurricane Maria.

A year after Hurricane Maria made landfall in Puerto Rico, more than 160,000 Puerto Ricans left the island for the U.S. mainland, according to researchers at the Center of Puerto Rican Studies at Hunter University. Analyzing data from Puerto Rico's Department of Education and the U.S. Census Bureau's American Community Survey, the researchers were able to determine this likely number of Puerto Rican migrants. Puerto Rico, like other Caribbean islands, faces the ill-effects of an uncertain economy and unmet social needs.¹⁵⁰ Preliminary findings, as of 2018, predict the island will suffer "up to a 20 decline in economic activity, with up to a cumulative \$100 billion in lost economic output" due to the fallout from Hurricane Maria.¹⁵¹ In addition to economic loss, reports from the Federal Emergency Management Agency show that Puerto Rico's entire electrical grid failed after the hurricane, and it took 90 days to restore power to 65 percent of the 3.3 million citizens. Water systems were inoperable; landslides shut down most roads, and the hurricane destroyed 95 percent of cellular sites.¹⁵² When it comes to the complex factors that influence a person's desire to migrate, Puerto Rico offers a poignant case study. Hurricane Maria, a severe storm, thus represents a migration push factor. In contrast, economic opportunities, better healthcare, food, housing, and state assistance signify pull factors. A combination of comparable factors will likely influence climate-induced migration in the future.

In the case of the most recent mass migration of familial units from the Northern Triangle (i.e., Guatemala, Honduras, and El Salvador), violence rather than natural

¹⁴⁹ Cuban-Haitian Entrant Act of 1980, H. Res. 7978, 96th Cong. (1980), <https://www.congress.gov/bill/96th-congress/house-bill/7978>.

¹⁵⁰ Centro, *Puerto Rico: One Year after Hurricane Maria*, RD2018-01 (New York: Center for Puerto Rican Studies, Hunter College, 2018), https://centropr.hunter.cuny.edu/sites/default/files/data_briefs/Hurricane_maria_1YR.pdf.

¹⁵¹ Centro, 3.

¹⁵² "Hurricane Maria," Federal Emergency Management Agency, accessed July 13, 2019, <https://www.fema.gov/hurricane-maria>.

disasters has pushed the population to migration. Nearly two years after Hurricane Maria, the United States once again witnessed a mass exodus of people seeking refuge in the United States. In fiscal year 2019, U.S. immigration officers apprehended approximately 978,000 migrants trying to cross the Southwest border between Mexico and the United States.¹⁵³ Many hailed from the Northern Triangle. Once reaching the U.S. border, the migrants also claimed asylum. At the height of the mass migrations, DHS deemed the events “an acute and worsening crisis.”¹⁵⁴ As such, CBP reassigned numerous agents to the Southwest Border, leaving other ports of entry understaffed. Overcrowding and prolonged detention also occurred across the Rio Grande Valley’s CBP facilities. Due to a lack of available beds, ICE was unable to provide long-term detention for adults, further straining the resources of CBP.¹⁵⁵ While the mass migrations from the Northern Triangle may have dwindled since the peak of the border crisis, the United States is still grappling with the long-term consequence of the events of last summer. To this day, over one million people are awaiting an Immigration Court hearing to determine their fate in the United States.¹⁵⁶ Yet, opportunities remain if the United States shifts its perspective on immigration from a burden to economic potential in years to come.

3. Shifting Demographics: An Economic Prospect

By the year 2050, the UN estimates the world’s population will reach 9.7 billion.¹⁵⁷ This significant rate of population growth, however, will not occur uniformly across all countries and regions. While the UN projects that Sub-Saharan Africa will see the highest population growth, China and Eastern Europe expect to see a decrease in population within the same timeframe.¹⁵⁸ Additionally, 25 percent of Europeans and North Americans will

¹⁵³ “U.S. Customs and Border Protection Announces September Border Enforcement Actions,” Customs and Border Protection, October 8, 2019, <https://www.cbp.gov/newsroom/national-media-release/us-customs-and-border-protection-announces-september-border>.

¹⁵⁴ Department of Homeland Security Office of the Inspector General, *Management Alert*, 9.

¹⁵⁵ Department of Homeland Security Office of the Inspector General.

¹⁵⁶ “Immigration Court Backlog Tool: Pending Cases and Length of Wait in Immigration Courts,” Syracuse University, accessed March 9, 2020, https://trac.syr.edu/phptools/immigration/court_backlog/.

¹⁵⁷ United Nations Department of Economic and Social Affairs, *World Population Prospects*, 5.

¹⁵⁸ United Nations, 6–13.

be 65 years or older 30 years from now. As such, European and North American governments will face rising financial strain to meet the healthcare and welfare needs of the group. At the same time, many will also suffer from a dwindling working-age population. Still, an opportunity remains: economic migration.

In the coming years, studies predict that migration will become more prevalent, with international migrants reaching approximately 400 million by 2050. The continuing effects of climate change, increasing conflict and poverty, globalization, and cheap travel will both drive and entice mass population movements. When managed correctly, this migration has the potential to boost the economies of both the receiving country and country of origin.¹⁵⁹ In countries with growing working-age populations, there is great potential. Sub-Saharan Africa and parts of Latin America, Asia, and the Caribbean expect to see large growth among their eligible workforce (i.e., those between the ages of 25 and 64). Thus, a feasible prospect exists for countries in Europe and the United States to leverage economic migrants to their advantage to meet the demands of their aging populations. Additionally, by 2030, the number of people living in extreme poverty could increase by 122 million because of the effects of climate change.¹⁶⁰ Lacking economic resiliency and adequate means of protection, many of the world's poorest countries will not have the resources necessary to adapt to a changing environment.¹⁶¹ Once again, economic migration offers an opportunity. The Caribbean Islands offer a salient example of the ways migration to the United States could help decrease poverty in the region. In turn, this migration could improve the economic resiliency of the populations remaining on the islands through remittances sent back to the islands by family members. In this way,

¹⁵⁹ United Kingdom Ministry of Defence, *Global Strategic Trends*, 12.

¹⁶⁰ Esuna Dugarova and Nergis Gülasan, *Global Trends: Challenges and Opportunities in the Implementation of the Sustainable Development Goals* (New York: United Nations Development Programme and United Nations Research Institute for Social Development, 2017), 37, <https://www.undp.org/content/undp/en/home/librarypage/sustainable-development-goals/global-trends--challenges-and-opportunities-in-the-implementation.html>.

¹⁶¹ United Nations Human Rights Council, *Report of the Office of the United Nations High Commissioner for Human Rights on the Relationship between Climate Change and Human Rights*, A/HRC/10/61 (New York: United Nations, 2009), 15, <https://digitallibrary.un.org/record/647215?ln=en>.

climate-induced migration offers a hopeful economic prospect versus a negative border crisis.

C. THE BIG PICTURE

Scenario II offers yet another possible version of the future. By exploring the future through the lens of this scenario, a range of conclusions become apparent. These findings, in turn, help widen the scope of challenges that policymakers might consider when contemplating federal agencies' strategic plans and future legislation.

1. A Regional Response to an International Problem

Since its creation after World War II, the UN has achieved international cooperation with many global issues. The UN's 1951 Refugee Convention established the international definition of a refugee in response to those displaced from World War II. The international adoption of this definition has helped many refugees escape persecution at the hands of their governments. As previously discussed, however, climate migrants fail to meet the definition of refugees. While many international solutions and proposals exist, the 193 members of the UN have yet to agree on any. Rather than approaching the challenge from an international perspective, Scenario 2 offers a regional response through negotiation among the leaders of the United States, Haiti, and the Bahamas.

In comparison to an international framework, regional agreements help better tailor the needs of the departing and receiving countries. For example, Bangladesh is also particularly vulnerable to the effects of climate change. Thus, how the region approaches climate-induced migration could be far different from how the United States decides to approach the same type of migrants from the Caribbean Islands. Allowing regions to develop their solutions to meet specific needs, therefore, proves far more feasible than an international response. Additionally, agreements in an international framework could take years, if not decades, to institute throughout the world. If the United States is to prepare for the possibility of climate-induced migrants, it cannot afford to wait on an international agreement through the UN or another comparable intergovernmental organization.

2. Reversing Current Narratives

As illustrated in the literature review, many discussions on climate-induced migration take on a fatalistic view. Nevertheless, migration need not be negative. Whether the world is or is not able to deter global warming to less than 2.0°C, climate-induced migration does offer opportunities especially for nations like the United States. If it leverages climate-induced migration correctly, the United States could benefit rather than suffer from it.

The homeland security of the United States relies on not only secure borders and approaches but also economic stability and resiliency.¹⁶² A growing elderly population coupled with a shrinking work-age group of adults will likely affect the future stability of the U.S. economy. Additionally, increasing severe weather, droughts, and other natural disasters will strain the federal, state, local, and tribal budgets. Without a large workforce contributing to the tax base, and a growing need for social services, the nation's debt may well grow. If expanded, employment-based migration could help alleviate the future threat of a declining U.S. economy, especially if the visas fill critical job shortages. Although the United States does offer a range of employment-based visas, many have statutory requirements or a numerical limit on the number of visas issued each fiscal year. For example, the H-2A visa applies only to temporary or seasonal agricultural workers and has no numerical limit.

Further, the U.S. Immigration Nationality Act limits the number of available visas to 66,000 per fiscal year for the H-2B program for temporary non-agricultural workers.¹⁶³ The U.S. government also limits visas for the H-1B program (i.e., workers in specialty occupations) to 65,000 visas annually.¹⁶⁴ Considering that workers worldwide can apply

¹⁶² Department of Homeland Security, *Strategic Plan*.

¹⁶³ "H-2B Temporary Non-Agricultural Workers," Citizenship and Immigration Services, May 29, 2020, <https://www.uscis.gov/working-in-the-united-states/temporary-workers/h-2b-temporary-non-agricultural-workers>.

¹⁶⁴ "H-1B Specialty Occupations, DOD Cooperative Research and Development Project Workers, and Fashion Models," Citizenship and Immigration Services, March 27, 2020, <https://www.uscis.gov/working-in-the-united-states/temporary-workers/h-1b-specialty-occupations-dod-cooperative-research-and-development-project-workers-and-fashion-models>.

for the program, these statutory requirements severely limit the realistic number of Caribbean islanders who might receive a visa. Finally, TN non-immigrant worker visas are strictly limited to Mexican and Canadian citizens under the United States–Mexico–Canada Agreement. These visas are specifically geared to professional-level careers (e.g., lawyers, teachers, doctors, and engineers).¹⁶⁵ Thus, the TN visa precludes all Caribbean islanders and any other climate migrants not from Mexico or Canada. Additionally, the program limits eligibility to professional-level workers only. With limited employment visa categories, therefore, a regional agreement between the United States and the Caribbean Islands could prove highly advantageous as a proactive response to future climate-induced migration, especially if expanded to include professional and non-professional workers.

3. A History of Ill-Preparedness

It is not a matter of if climate change will force people to cross borders to seek safety, but rather when. The United States is not currently prepared to handle a mass influx of climate-induced migrants. Over the last 40 years, DHS and the former Immigration Naturalization Services have demonstrated an inconsistent lack of preparedness. DHS continues to deal with the fallout from the 2019 Southern Border crisis. The Mariel boatlift, in turn, created a whole new immigration law, the Cuban Haitian Entrant Act.¹⁶⁶ Although U.S. citizens, Puerto Rican migrants to the U.S. mainland offer another poignant example of human displacement from a sudden-onset disaster, Hurricane Maria. While many Americans remain politically divided on the topic of climate change, it is clear migration patterns are changing and will continue well into the future. Thus, DHS can once again take a reactive approach to the future threat or proactively prepare.

4. Moving Forward

Scenario 2 offers an alternative version of the year 2050. In this version of the future, global temperatures have far surpassed the recommendation of the Paris Agreement

¹⁶⁵ “TN NAFTA Professionals,” Citizenship and Immigration Services, May 29, 2020, <https://www.uscis.gov/working-in-the-united-states/temporary-workers/tn-nafta-professionals>.

¹⁶⁶ Cuban-Haitian Entrant Act of 1980.

and IPCC to curb global warming to 2.0°C or less. As a result, the effects of climate change have exponentially grown worse. At the same time, shifts in demographics, globalization, and economic disparity have also reshaped the world as we know it. In assessing Scenario 2, it becomes clear that just like in Scenario 1, both threats and opportunities exist in such a future. The ways in which U.S. decisionmakers decide to handle such critical uncertainties could have a distinct impact on the country's preparedness, or lack thereof, to handle future mass migratory events. The final chapter, Chapter V, offers further ways in which governmental leaders, including those within DHS, might prepare to handle cross-border climate change–induced migration to the United States.

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V. FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

There is no perfect way to predict the future. Acknowledging this fact, this thesis contemplated the many avenues the future might take over the next 30 years, specifically focusing on how the United States might prepare to handle cross-border climate-induced mass-migration events. Rather than settling on one concrete version of the future, this thesis explored the intersecting global megatrends and key variables that will likely shape the world, the United States, and a person's choice to migrate. Whether from being forcibly displaced or moving for economic opportunity, family reunification, or lifestyle choices, migration is likely to continue well into the future. Therefore, the security of U.S. borders and approaches will continue to be a key DHS mission. While U.S. policymakers may be unable to control how climate change-induced migration will occur, they can prepare for it by giving equal attention and consideration to multiple versions of the future, weighing options and implementing cost-effective decisions.

To help answer the original question posed by this thesis—How might the United States prepare to handle cross-border climate change-induced migration—two alternative versions of the year 2050 were created. To demonstrate the varied directions the future might unfold, each hypothetical scenario combined different carbon emission and global warming pathways coupled with intersecting megatrends. The remaining sections of this chapter detail the findings, conclusions, and policy recommendations resulting from this thesis.

A. SUMMARY OF FINDINGS

The scenarios presented in this thesis represent two different sets of interconnected global megatrends and key variables. As such, both Scenario 1 and 2 each offer a unique set of policy implications regarding climate-induced migration. Although each scenario assesses a different version of the future, three recurring themes were identified. First, migration is a form of adaptation to a multitude of push-and-pull factors. Second, the changing nature of international power and negotiation will make future international resolutions difficult to achieve. Thus, regional and national agreements could prove far

more time efficient and advantageous to both the receiving and departing nations. Finally, if leveraged correctly, critical uncertainties, especially those related to migration and climate change, could help the United States compete with future emerging economies.

1. Adaptation through Migration

Giving people opportunities to move recognizes human agency and allows people to take charge of their own lives.

—Jane McAdam¹⁶⁷

Migration has and will always be multicausal. Global warming, whether limited to less than 2.0°C or not, will likely play a role in people's choices to migrate in the coming years. As Robert McLeman describes in his book *Climate and Human Migration*, migration exists on a continuum based on agency (i.e., freedom of choice). On one end of the spectrum, little to no choice exists. Otherwise known as forced displacement, this category includes slavery, human trafficking, refugees, and the displaced. On the opposite side of the continuum are high forms of agency, including migration for economic opportunity, family reunification, and lifestyle choice (e.g., snowbirds traveling from colder climates to warmer areas during the winter season).¹⁶⁸ Although climate-induced migration technically falls under forced displacement, it can be a form of adaptation. This, however, requires that the most vulnerable populations have a choice to move instead of being forcefully displaced (see Figure 12).

¹⁶⁷ Jane McAdam, "Managing Displacement in the Era of Climate Change," *Georgetown Journal of International Affairs*, November 7, 2019, <https://www.georgetownjournalofinternationalaffairs.org/online-edition/2019/11/6/managing-displacement-in-the-era-of-climate-change>.

¹⁶⁸ Robert A. McLeman, *Climate and Human Migration* (New York: Cambridge University Press, 2014), loc. 965–1089 of 8764, Kindle.

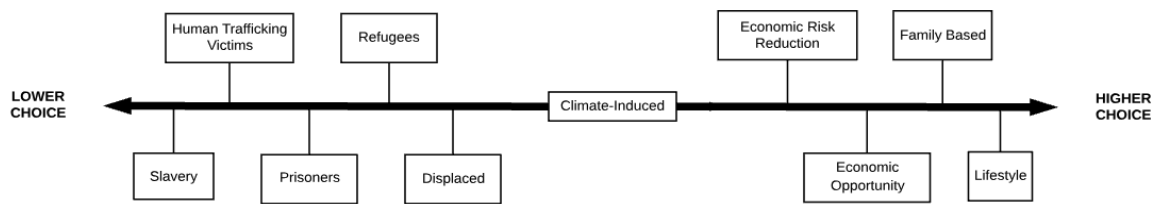


Figure 12. Migration Continuum¹⁶⁹

Shifting climate-induced migration from a victim-based narrative to one of choice gives climate-induced migrants a sense of agency and provides benefits to both the receiving and departing nations. Thus, no matter how the future may look in the year 2050, migration will continue to play a role in geopolitics and, more importantly, in the homeland security of the United States.

2. Near-Term Infeasibility of an International Framework

Governments will need to understand their role in a changing world order and how to accommodate emerging powers. Failure to adapt risks a polarised, less-stable world with a higher likelihood of conflict.

—United Kingdom Ministry of Defence¹⁷⁰

The future international power of the United States is no longer a given. Thus, the United States and DHS must consider a future where the country has far less global influence. As the balance of power shifts in favor of emerging economies, this will greatly affect the negotiation and adoption of international frameworks and resolutions. Although international cooperation will continue to be of utmost importance, adopting timely resolutions may become far more difficult. Negotiations could stall or eventually fail because of member states' competing priorities. Thus, waiting for an international framework to handle climate change-induced migration and the regulation of

¹⁶⁹ Adapted from Robert McLeman, *Climate and Human Migration*, loc. 967–77.

¹⁷⁰ United Kingdom Ministry of Defence, *Global Strategic Trends*, 18.

geoengineering is not currently feasible. The United States cannot delay action in hopes that the international community will come to a timely solution on either complex issue.

Regional treaties between sovereign nations and accompanying national plans are for more likely to result in proactive policymaking and corresponding action. Unlike an international agreement, a regional framework would narrow the scope of negotiation, and participating countries. While a regional agreement may be the best near-term course of action for the United States to pursue, this does not mean the country should forgo international cooperation and resolutions. The Geneva Convention, the Chemical Weapons Convention, and the Paris Agreement have all had significant impacts on the world as we know it. Therefore, the United States should continue to cooperate and promote such efforts while, at the same time, pursuing proactive measures at a regional level to handle the future threats of climate-induced migration.¹⁷¹

3. Leveraging Critical Uncertainties

Thinking through options—even unlikely (or undesirable) options—and giving them equal attention and consideration is what leads to robust thinking about the future.

—Thomas J. Chermack¹⁷²

The next 30 years hold a multitude of critical uncertainties. Global megatrends are likely to have a strong influence on the way the future unfolds. As demonstrated in this thesis, climate change, shifting demographics, globalization, accelerating technology, and emerging economies will have a strong effect on geopolitics and power. When assessing how these trends might intersect, it is very possible to leverage critical uncertainties to the advantage of the United States.

Shifting demographics are one key megatrend that could have significant impacts on the future economic prestige of the United States. A growing elderly population

¹⁷¹ “History of the United Nations,” United Nations, August 21, 2015, <https://www.un.org/en/sections/history/history-united-nations/index.html>.

¹⁷² Chermack, *Scenario Planning in Organizations*.

combined with a shrinking workforce will strain the financial resources of federal and local governments alike. Although economic power is but one contributing factor to international influence, its importance cannot be overstated. As more emerging economies increase their GDP, this will likely shift the balance of power and lead to further polarization, as previously discussed. Thus, the United States must find new innovative ways to ensure continued economic resiliency and international influence. Climate-induced migration and a robust technology industry in energy and geoengineering both offer significant opportunities.

First, climate-induced migrants could fill critical job shortages that are likely to increase in the future. Health and elderly care are two key sectors that will be especially important in coming years for an aging U.S. population. A strong economic migration program will also significantly contribute to the U.S. tax base. With increased revenue, the government will have far more flexibility to maintain important social programs for the elderly and the rest of the country. Such a population could also help support economic resilience, another key tenet of the DHS mission.

Maintaining a strong diversified energy and geoengineering technology sector is also incredibly important for the future economy of the United States. As previously discussed, China is setting itself up to be a world leader in non-fossil fuel energy and the adoption of geoengineering. The Asian nation is cornering the market in the production of solar panels and energy storage (i.e., lithium batteries). If the United States continues to use both, the nation's supply chain will become increasingly dependent on China. Additionally, China is scaling up its nuclear industry. If all goes as planned, it will outrank France and the United States in the next decade with its growing number of nuclear power plants. Finally, China is also heavily investing in geoengineering, as illustrated by Sky River Project and the recent creation of the government-sponsored geoengineering research program. By creating a strong market in all three sectors, it is very possible that China could entice the United States' best and brightest to the nation. U.S. corporations in all three fields might also follow suit. Thus, China presents three key threats to the United States: 1) strong economic growth, and the subsequent increase in international influence to rival the United States; 2) control of the U.S. supply chain for solar panels and renewable

energy storage solutions; and 3) U.S. brain drain. While all three represent serious risks to the United States, they once again offer an opportunity that U.S. economic migrants, especially those highly vulnerable to the effects of climate change, could fill, especially those in the fields of science, technology, engineering, and mathematics.

B. CONCLUSIONS

Even with years of more research and corresponding written pages, this thesis would still fail to capture all the intricacies of cross-border climate change–induced migration and its implications on the future of U.S. security. As such, this section offers an introspective review of the areas of limitations of this thesis and future research considerations.

1. Limitations

All research holds some limitations, and this thesis is no different. This section offers a review of the confines of this study.

Foremost, this thesis focused on how the United States might prepare for future climate change–induced migration from a decidedly homeland security perspective. The research and subsequent policy recommendations were specifically geared to the federal government and the legislative and executive branches. Yet, state, local, and tribal-level government will also need to prepare for climate-induced migration. This set of policy implications, however, was not considered.

Second, as previously discussed in the literature review, specific statistics on climate change–induced migration are extremely varied. Future projections range from 25 million to one billion climate migrants by the year 2050. This broad prediction includes both internal and cross-border displacement and is not based on definitive scientific projections.¹⁷³ This wide range of data, therefore, made it difficult to assess the specific impact climate-induced migration could have on the future security of the United States.

¹⁷³ Baher Kamal, “Climate Migrants Might Reach One Billion by 2050,” Inter Press Service, August 21, 2017, <http://www.ipsnews.net/2017/08/climate-migrants-might-reach-one-billion-by-2050/>.

Additionally, this thesis did not adhere to all the standards of the Royal Dutch Shell's scenario planning process. Due to time constraints, the typical four scenarios were not completed. The study also did not include a group of participants. As explained by Volkery and Ribeiro, "Broader participation improves the relevance and legitimacy of the exercise."¹⁷⁴ Thus, the policy implications derived from this thesis are not as comprehensive as they might have been had more key stakeholders been involved.

Finally, this thesis did not fully consider the impact that the COVID-19 pandemic might have on global megatrends. While briefly discussed in Scenario 1, it was impractical to comprehensively assess the future effects of the coronavirus and its relations to climate change-induced migration while the pandemic remains ongoing. For example, the outbreak could have long-lasting effects on globalization and free trade, both of which in turn could influence future migration patterns. As predicted in the *Economist*, "The pandemic will politicise travel and migration and entrench a bias towards self-reliance."¹⁷⁵

While this thesis did not address the above, these study limitations do offer a range of future research opportunities.

2. Future Research

The intent of this thesis was to explore ways the United States might prepare for future climate-induced migration, an area of research that should and must continue in the coming decades. As such, the following suggestions on future research might be pursued by others to further expand on the groundwork of this thesis.

First, key stakeholders could be added to the scenario development process. In the context of the future of U.S. homeland security, participants might include those from the federal government (e.g., DHS, USCIS, ICE, CBP, and USCG) and state and local governments most likely to experience future climate-induced migration (e.g., Miami, Florida; El Paso, Texas; and Nogales, Arizona).

¹⁷⁴ Volkery and Ribeiro, "Scenario Planning in Public Policy."

¹⁷⁵ "Has Covid-19 Killed Globalisation?," *Economist*, May 14, 2020, <https://www.economist.com/leaders/2020/05/14/has-covid-19-killed-globalisation>.

Additional scenarios could be created to include a wider range of intersecting megatrends, including the recent effects of the COVID-19 pandemic. The creation and analysis of additional scenarios could lead to a more robust analysis of the future homeland security threats the United States might experience.

Regional cross-border migration patterns following climatic disasters (e.g., prolonged droughts, hurricanes, and flooding) should be further assessed. Disaster-driven migration from the Caribbean and Central and Southern Mexico could help narrow projections of the future number of climate-induced migrants who may attempt to come to the United States. As a result, such data could help researchers tailor more specific policy recommendations.

Finally, more integrated assessment models on climatic disasters and subsequent cross-border migration are needed. This could help researchers better understand the relation between the effects of climate change and migration. In turn, such findings would help U.S. decisionmakers better allot funds and programs to the greatest areas of risk.

Much future research remains within the field of climate-induced migration, especially regarding the threats such events pose to U.S. security. Expanding research in this area could in turn help the United States prepare for the future challenges associated with climate-induced migration.

C. RECOMMENDATIONS

Climate change is too important to leave just to the environmentalists. . . .
It's a whole-of-society issue and we need an all-hands-on-deck approach.

—Sherri Goodman¹⁷⁶

The ultimate endeavor of this thesis was to implement research into practice. As such, this thesis offers the following seven recommendations regarding future policies, practices, and procedures.

¹⁷⁶ Gordon and Gurumurthy, “Climate Change.”

1. DHS should incorporate climate change into all six homeland security missions and update the *DHS Strategic Plan* accordingly. The effects of climate change will impact DHS in its entirety, not only the U.S. immigration system. Instead of reinventing the wheel, DHS should re-assess the prior recommendations and actions laid out in the former *DHS Climate Action Plan* and reinstitute best practices as appropriate.
2. In terms of immigration, DHS and its immigration sub-branches should re-assess the impacts climate change will have on mass migrations from the Caribbean, Central America, and South America.
3. The Department of State should expand the scope of the Caribbean Basin Security Initiative to include climate-induced migration and its related security implications.
4. The United States should pursue a regional free-movement agreement with the Caribbean Islands focused on climate-induced migration. In addition, Congress should consider creating a Caribbean-specific temporary visa program focused on critical job shortages, using Australia's Pacific Labour Scheme as a replicable framework.
5. Congress should assess expanding the United States–Mexico–Canada Agreement to include other countries in the region (e.g., Central and South America). Additionally, the types of eligible workers for the TN visa category should be expanded to those within non-professional fields.
6. Congress should amend current immigration law to increase the annual statutory limit on H-1B and H-2B worker visas as a preemptive method to promote legal and well-regulated migration versus climate-induced mass-migration events.
7. Finally, the United States should pursue a North American regional agreement regulating the use of geoengineering for near-term implementation. At the same time, the United States should continue

negotiations at an international level for worldwide regulations of geoengineering for long-term implementation.

The above offers a broad range of recommendations that could be pursued. The scenario-planning research methodology and its all-encompassing result demonstrate how scenarios can contribute to the policymaking process. This thesis specifically addressed the first three phases of the policymaking process by identifying the policy issue (i.e., cross-border climate change–induced migration), highlighting the relevance of the problem from a societal perspective, and offering a range of problem-solving strategies in the form of recommendations. To complete the policymaking cycle, these recommendations would ultimately need to be implemented and tested for effectiveness.¹⁷⁷ If the policies do not adequately address the issue, the cycle can begin anew—once again using the methodology of scenario planning.

Scenario planning offers tangible means to assess the many ways the future might unfold. In doing so, scenarios can illustrate to policymakers the wide variety of future threats and opportunities that climate-induced migration poses. Once they are identified, the United States can be better prepared to plan for the years to come and ensure the future security of the nation. As President Eisenhower warned in his final address to the nation, “As we peer into society’s future, we—you and I, and our government—must avoid the impulse to live only for today, plundering, for our own ease and convenience, the precious resources of tomorrow.”¹⁷⁸

¹⁷⁷ Volkery and Ribeiro, “Scenario Planning in Public Policy.”

¹⁷⁸ Dwight D. Eisenhower, “Text of the Address by President Eisenhower” (speech, Washington, DC, January 17, 1961), <https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/farewell-address/1961-01-17-press-release.pdf>.

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