"The Great Climate Migration" by Abrahm Lustgarten

Part 3:

In November 2007, Alan B. Krueger, a labor economist known for his statistical work on inequality, walked into the Princeton University offices of Michael Oppenheimer, a leading climate geoscientist, and asked him whether anyone had ever tried to quantify how and where climate change would cause people to move.

Earlier that year, Oppenheimer helped write the U.N. Intergovernmental Panel on Climate Change report that, for the first time, explored in depth how climate disruption might uproot large segments of the global population. But as groundbreaking as the report was — the U.N. was recognized for its work with a Nobel Peace Prize — the academic disciplines whose work it synthesized were largely siloed from one another. Demographers, agronomists and economists were all doing their work on climate change in isolation, but understanding the question of migration would have to include all of them.

Together, Oppenheimer and Krueger, who died in 2019, began to chip away at the question, asking whether tools typically used by economists might yield insight into the environment's effects on people's decision to migrate. They began to examine the statistical relationships — say, between census data and crop yields and historical weather patterns — in Mexico to try to understand how farmers there respond to drought. The data helped them create a mathematical measure of farmers' sensitivity to environmental change — a factor that Krueger could use the same way he might evaluate fiscal policies, but to model future migration.
Their study, published in 2010 in Proceedings of the National Academy of Sciences, found that Mexican migration to the United States pulsed upward during periods of drought and projected that by 2080, climate change there could drive 6.7 million more people toward the Southern U.S. border. "It was," Oppenheimer said, "one of the first applications of econometric modeling to the climate-migration problem."

The modeling was a start. But it was hyperlocal instead of global, and it left open huge questions: how cultural differences might change outcomes, for example, or how population shifts might occur across larger regions. It was also controversial, igniting a backlash among climate-change skeptics, who attacked the modeling effort as "guesswork" built on "tenuous assumptions" and argued that a model couldn't untangle the effect of climate change from all the other complex influences that determine human decision-making and migration. That argument eventually found some traction with migration researchers, many of whom remain reluctant to model precise migration figures.

But to Oppenheimer and Krueger, the risks of putting a specific shape to this well established but amorphous threat seemed worth taking. In the early 1970s, after all, many researchers had

made a similar argument against using computer models to forecast climate change, arguing that scientists shouldn't traffic in predictions. Others ignored that advice, producing some of the earliest projections about the dire impact of climate change, and with them some of the earliest opportunities to try to steer away from that fate. Trying to project the consequences of climate-driven migration, to Oppenheimer, called for similarly provocative efforts. "If others have better ideas for estimating how climate change affects migration," he wrote in 2010, "they should publish them."

Since then, Oppenheimer's approach has become common. Dozens more studies have applied econometric modeling to climate-related problems, seizing on troves of data to better understand how environmental change and conflict each lead to migration and clarify how the cycle works. Climate is rarely the main cause of migration, the studies have generally found, but it is almost always an exacerbating one.

As they have looked more closely, migration researchers have found climate's subtle fingerprints almost everywhere. Drought helped push many Syrians into cities before the war, worsening tensions and leading to rising discontent; crop losses led to unemployment that stoked Arab Spring uprisings in Egypt and Libya; Brexit, even, was arguably a ripple effect of the influx of migrants brought to Europe by the wars that followed. And all those effects were bound up with the movement of just two million people. As the mechanisms of climate migration have come into sharper focus — food scarcity, water scarcity and heat — the latent potential for large-scale movement comes to seem astronomically larger.

North Africa's Sahel provides an example. In the nine countries stretching across the continent from Mauritania to Sudan, extraordinary population growth and steep environmental decline are on a collision course. Past droughts, most likely caused by climate change, have already killed more than 100,000 people there. And the region — with more than 150 million people and growing — is threatened by rapid desertification, even more severe water shortages and deforestation. Today researchers at the United Nations estimate that some 65 percent of farmable lands have already been degraded. "My deep fear," said Solomon Hsiang, a climate researcher and economist at the University of California, Berkeley, is that Africa's transition into a post-climate-change civilization "leads to a constant outpouring of people."

The story is similar in South Asia, where nearly one-fourth of the global population lives. The World Bank projects that the region will soon have the highest prevalence of food insecurity in the world. While some 8.5 million people have fled already — resettling mostly in the Persian Gulf — 17 million to 36 million more people may soon be uprooted, the World Bank found. If past patterns are a measure, many will settle in India's Ganges Valley; by the end of the century, heat waves and humidity will become so extreme there that people without air-conditioning will simply die.

If it is not drought and crop failures that force large numbers of people to flee, it will be the rising seas. We are now learning that climate scientists have been underestimating the future displacement from rising tides by a factor of three, with the likely toll being some 150 million globally. New projections show high tides subsuming much of Vietnam by 2050 — including most of the Mekong Delta, now home to 18 million people — as well as parts of China and Thailand, most of southern Iraq and nearly all of the Nile Delta, Egypt's breadbasket. Many coastal regions of the United States are also at risk.

Through all the research, rough predictions have emerged about the scale of total global climate migration — they range from 50 million to 300 million people displaced — but the global data is limited, and uncertainty remained about how to apply patterns of behavior to specific people in specific places. Now, though, new research on both fronts has created an opportunity to improve the models tremendously. A few years ago, climate geographers from Columbia University and the City University of New York began working with the World Bank to build a next-generation tool to establish plausible migration scenarios for the future. The idea was to build on the Oppenheimer-style measure of response to the environment with other methods of analysis, including a "gravity" model, which assesses the relative attractiveness of destinations with the hope of mathematically anticipating where migrants might end up. The resulting report, published in early 2018, involved six European and American institutions and took nearly two years to complete.

The bank's work targeted climate hot spots in sub-Saharan Africa, South Asia and Latin America, focusing not on the emergency displacement of people from natural disasters but on their premeditated responses to what researchers call "slow-onset" shifts in the environment. They determined that as climate change progressed in just these three regions alone, as many as 143 million people would be displaced within their own borders, moving mostly from rural areas to nearby towns and cities. The study, though, wasn't fine-tuned to specific climatic changes like declining groundwater. And it didn't even try to address the elephant in the room: How would the climate push people to migrate across international borders?

In early 2019, The Times Magazine and ProPublica, with support from the Pulitzer Center, hired an author of the World Bank report — Bryan Jones, a geographer at Baruch College — to add layers of environmental data to its model, making it even more sensitive to climatic change and expanding its reach. Our goal was to pick up where the World Bank researchers left off, in order to model, for the first time, how people would move between countries, especially from Central America and Mexico toward the United States.

First we gathered existing data sets — on political stability, agricultural productivity, food stress, water availability, social connections, weather and much more — in order to approximate the kaleidoscopic complexity of human decision-making.

Then we started asking questions: If crop yields continue to decline because of drought, for instance, and people are forced to respond by moving, as they have in the past, can we see where they will go and see what new conditions that might introduce? It's very difficult to model how individual people think or to answer these questions using individual data points — often the data simply doesn't exist. Instead of guessing what Jorge A. will do and then multiplying that decision by the number of people in similar circumstances, the model looks across entire populations, averaging out trends in community decision-making based on established patterns, then seeing how those trends play out in different scenarios.

In all, we fed more than 10 billion data points into our model. Then we tested the relationships in the model retroactively, checking where historical cause and effect could be empirically supported, to see if the model's projections about the past matches what really happened. Once the model was built and layered with both approaches — econometric and gravity — we looked at how people moved as global carbon concentrations increased in five different scenarios, which imagine various combinations of growth, trade and border control, among other factors. (These scenarios have become standard among climate scientists and economists in modeling different pathways of global socioeconomic development.)

Only a supercomputer could efficiently process the work in its entirety; estimating migration from Central America and Mexico in one case required uploading our query to a federal mainframe housed in a building the size of a small college campus outside Cheyenne, Wyo., run by the National Center for Atmospheric Research, where even there it took four days for the machine to calculate its answers.

The results are built around a number of assumptions about the relationships between real-world developments that haven't all been scientifically validated. The model also assumes that complex relationships — say, how drought and political stability relate to each other — remain consistent and linear over time (when in reality we know the relationships will change, but not how). Many people will also be trapped by their circumstances, too poor or vulnerable to move, and the models have a difficult time accounting for them.

All this means that our model is far from definitive. But every one of the scenarios it produces points to a future in which climate change, currently a subtle disrupting influence, becomes a source of major disruption, increasingly driving the displacement of vast populations.