

Where will future migrants come from?

August 21 2018, by Sarah Fecht



Environmental pressures shape migration patterns around the world. A team that includes researchers from Columbia's Earth Institute is developing a model that anticipates how people will move in the future. Credit: [Rebecca Harms](#), Flickr

In times of desperation—after a hurricane flattens a community, for example, or droughts cause widespread hunger—people inevitably search for better lives and better opportunities elsewhere. In some cases, migrants may stream into cities or countries that are not prepared to support such a large influx. Chaos, suffering, and social tension can result.

That's why Michael Puma and his colleagues are creating a [model](#) that will estimate where people will move in response to future crises. By anticipating these movements, nations will be better able to organize shelter, social support, employment opportunities, and other services that

could facilitate a migrant's smooth and safe transition into his or her new community.

With up to five years of funding from the U.S. Department of Defense, the team aims to build a [migration](#) model that's more comprehensive than those that have come before it, and will be useful in a wide range of situations, from natural disasters to wars and food insecurity.

"Other modeling approaches have been piecemeal and fragmented," explains Puma, a climate and food systems researcher and director of the Center for Climate Systems Research at Columbia's Earth Institute. "Our platform will incorporate the best features of existing models and include improvements that fill in the numerous gaps in our understanding of migration."

By drawing a more complete picture of how and why people move, the researchers aim to identify and quantify tipping points that can trigger migration, so that countries can take a more proactive role in providing humanitarian support and alleviating the root causes of migration.

Time for a New Approach

The traditional way of studying migration is to analyze individual households' reasons for leaving their home. Puma thinks the multidisciplinary team that's building the [new model](#) will be able to bring a different perspective.

"For migration, the majority of efforts have taken a bottom-up approach, with less emphasis on understanding the global system," he says. "My experience with modeling global climate is that you can't keep track of the behavior of every individual cloud or tree. You have to try to make approximations to model the system as a whole."

The time is right for a global approach to migration, he says, because with internet access and expanding transportation networks it is easier than ever to move from country to country.

Evaluating Environmental Effects

Environmental changes will be central to the team's analyses. Natural systems can both influence and be influenced by migration patterns, but these interactions haven't been thoroughly simulated in the past, say the researchers.

The team plans to model these [environmental effects](#) by comparing them to variables that are included in traditional models. Sudden shocks like earthquakes and hurricanes, for example, likely cause similar migration patterns to disruptions such as war and civil unrest, where people don't have much time to plan where they're going or how they'll get there. With migration from gradual changes like prolonged drought, on the other hand, people have more time to consider different destinations. These scenarios may resemble [migration patterns](#) where people come and go for economic reasons.

The relationship between migration and the environment has additional nuances, though. Droughts can lead to social conflicts, for example, while a large influx of migrants can overwhelm the natural resources in an area. As one destination becomes tapped out, later migrants may need to find other destinations, giving rise to new movement patterns.

Climate change, and the shifting temperature and rainfall patterns that come with it, add to the complexity. "As the climate changes, maybe we're going to see movements from regions we haven't seen in the past," says Puma. "This model will give us some way of identifying the regions we should be paying attention to."

As for where people migrate to, that's influenced by a variety of factors. These can include physical closeness, diplomatic ties, shared religious beliefs, and the presence of other expatriates. Immigration policies often play a vital role as well. For example, after Hurricane Mitch devastated Central America in 1998, the U.S. offered a Temporary Protective Status that allowed an influx of Hondurans such as the U.S. had never seen before.

The team's comprehensive model will include these different variables, and help to quantify how changes in the environment and policy will affect where people move to and from.

Building a Safer Future

The model isn't meant to predict exactly what will happen in the future, says Puma. "We're not developing a crystal ball. It's really a tool to understand the potential movement of people for a range of different scenarios." By understanding the range of possibilities, countries can anticipate, plan ahead, and hopefully reduce negative outcomes.

When the model is ready, the team will test it by seeing if it can accurately simulate past scenarios, as well as by vetting it with panels of experts. Puma hopes it will serve as a useful tool for policymakers, the Department of Defense (which often gets involved in humanitarian crises overseas), as well as the broader academic community.

Eventually, the model may help to prevent the need for people to flee their homes in the first place. Sometimes, sending aid and helping to stabilize a foreign country can actually require fewer resources than taking in refugees and migrants, while also saving lives. Puma hopes the model will help policymakers to make those types of calculations.

"Generally speaking, people prefer to stay in their homelands and home

countries," he says. "With this model, when we see situations emerging, we can ask how we can protect the civilian populations and limit the number of displaced people."

This story is republished courtesy of Earth Institute, Columbia University
<http://blogs.ei.columbia.edu>.

Provided by Earth Institute, Columbia University

Citation: Where will future migrants come from? (2018, August 21) retrieved 23 April 2024 from <https://phys.org/news/2018-08-future-migrants.html>

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