Predictive modelling

Christopher Smith, Dominic Kniveton, Sharon Wood and Richard Black

Empirical modelling techniques are the only way to effectively simulate migration resulting from a complex combination of pressures and opportunities.

There is considerable uncertainty in predicting climate change-induced migration. Firstly, we do not know the extent and magnitude of the climate changes responsible for pushing and pulling migrants. Secondly, the individual contexts, perceptions and behaviour of those affected by climate changes vary considerably. An agent-based modelling (ABM) technique can be used to simulate the relationship between the influence of environmental factors, climate variability and change and migration. According to the rules created for a particular simulation,
conditions. With predictions ranging from seasonal forecasts of a heavy monsoon to shifts in rainfall patterns due to climate change, humanity faces two new challenges: not just preparing for the foreseeable climate but also modifying decision-making processes in order to incorporate the availability of new information.

**Prediction is not enough**

People must both understand and trust warnings, and they must have the capacity to respond in an adequate manner. In the year 2000, the Limpopo river basin in southern Africa experienced a very substantial rainfall for many days as a result of unusual cyclones. Experts knew that it would result in serious flooding – of a magnitude never experienced before by rural communities in Mozambique. Yet very few villages were informed about it.

Most communities had no electricity or radio, yet people had previously been able to successfully predict floods by observing ants. Ants build their homes underground; when groundwater rises, they leave their nests – and people know that the water is rising. On this occasion the flood came so rapidly there was no time for the groundwater to rise, or for ants to react before the river overflowed.

When someone who had heard the experts’ prediction drove to a certain village to tell them to evacuate, the local chief asked him, “Who are you and why should I do what you say? Since the times of my ancestors, floods have only occurred after ants leave their homes. Now the ants are not moving and you come and ask me to leave?”

As in most of the Limpopo valley, many people did not evacuate.

About 700 people drowned. The global climate is changing, and traditional knowledge is increasingly unreliable because our past experience does not necessarily apply to present and future risks. In that light, the key is to learn how to communicate new knowledge about future conditions in ways that can be understood and trusted.

While most people in vulnerable communities have already noticed unusual extreme events taking place, they often explain such events through supernatural forces, such as divine punishment or intervention by angry ancestors. This kind of explanation leads to the belief that things will soon return to normal or to fatalism and inaction.

As a Mozambican woman farmer said during a Red Cross workshop: “If God wants to punish me, I will be punished, no matter what I do.”

However, that form of thinking can be changed by access to new information. After learning about the very basics of the climate change process and watching a short video on the impacts of more frequent flooding in Argentina and Bangladesh, the same farmer said: “I thought my community was the only one punished this hard, and that it wouldn’t happen again. But now I see that women all over the world are suffering in similar ways; so maybe it is true that the rains are changing and will continue to change, and maybe I can do something about it.”

Now the cyclone warning system set up by the Mozambican government uses a colour-coded system with flags to label approaching cyclones. The Mozambique Red Cross helped design and implement the system, asking communities about traditional forecasting methods and sharing information about new ways to make predictions. A recognisable system was set up, based on radios, flags and whistles for broadcasting alerts. Escape routes and other response options were identified and publicised at community level. This greatly contributed to minimising human losses during the next intense cyclones to hit the country.

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A global research agenda

Koko Warner and Frank Laczko

Given the magnitude of the challenges ahead, we urgently need to develop a policy-oriented global research agenda.

The topic of environmental change, particularly climate change, and migration is exploding onto the global policy agenda. Yet little evidence-based research exists to inform sound decision making.

To address the need for more sound empirical research and to identify how to carry forward a global research agenda, the UN University Institute for Environment and Human Security (UNU-EHS) together with the International Organization for Migration (IOM) and the UN Environment Programme (UNEP) brought together 35 experts in the fields of migration and the environment in April 2008. They assessed the current knowledge base and identified research gaps and priority areas for research, which fell within three main areas:

1. Measurement and Identification

More work is needed to conceptualize and quantify migration responses to the impact of environmental change and degradation. The existing, speculative estimates about the potential scale of environmentally induced human displacement underline the fact that we know very little about how changes in the environment affect migration and that we lack the data and research necessary to move beyond such estimates. We do not understand well how slow-onset events, including desertification, sea-level rise and deforestation, affect migration within and between countries. Nor do we know much about how expected changes in migration patterns are likely to affect the environment. Policymakers lack the information necessary to prepare for, prevent or respond effectively to environmental migration.