A Conversation with Klaus Keller on April 18, 2013

Participants

- Klaus Keller – Associate Professor of Geosciences, Pennsylvania State University
- Alexander Berger – Senior Research Analyst, GiveWell
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Note: This set of notes was compiled by GiveWell and gives an overview of the major points made by Klaus Keller.

Summary
Klaus Keller is an Associate Professor of Geosciences at Pennsylvania State University. He directs the NSF-funded research network for Sustainable Climate Risk Management (SCRiM, http://scrimhub.org/index.php). Keller's research focuses on past and potential future changes in the climate system as well as climate risk-management.

GiveWell spoke with Keller about potential impacts of climate change, specifically from tail area risks, and philanthropic decision-making about climate risk-management in the face of uncertainty.

Uncertainty surrounding impact projections

Unabated emissions of greenhouse gases could result in catastrophic climate change impacts for some. Potential climate stressors driving these impacts include warming (e.g., via health impacts), drought (e.g., via agriculture impacts), and sea level rise (e.g., via displacement and potential for conflicts).

Projections of climate change impacts are deeply uncertain. Characterizing this uncertainty is an active research area. One, thus far, largely open question concerns how the different climate change effects interact. For example, relatively simple physics predicts that emitting greenhouse gases acts to raise global mean temperatures and sea-levels. Understanding how these physical changes affect humans requires an analysis of the coupled natural and human systems. Consider, as an example, the task to assess future flooding risk in New York City. This requires not only an assessment of realistic sea-level rise scenarios, but also an analysis of likely climate change adaptation strategies for a given sea-level rise scenario.

Tail area events and geoengineering

Climate change impacts can rise in a highly nonlinear fashion in response to climate change. Consider, again, the example of flooding risks. The impacts of sea-level rise can increase drastically, once the water levels rise above a critical threshold. Another example is a situation where climate is highly sensitive to changes in greenhouse gas concentrations (technically: a high climate sensitivity). Uncommon and extreme events can be key factors in the analysis of risk-management strategies. These events are

sometimes referred to as 'tail area events', because they are located in the tail of the probability density function.

How to respond to climate change tail-area events such as climate sensitivity? One potential response, analyzed by some, is geoengineering. For example, increasing the aerosol concentration in the stratosphere would increase the Earths albedo and cool, on average, the Earth's surface. However, this geoengineering approach can have potentially severe negative side effects, such as abrupt warming in case the geoengineering is stopped or changing precipitation patterns. One additional risk associated with geoengineering strategies is a potential for conflict. This is because geoengineering might "succeed" for some, while causing negative effects for others. Who would decide about an appropriate level of geoengineering? Would the decision be arrived at in a civil way?

Decision-making for philanthropic investment

Assessing the expected value of investments in this area is nontrivial. For one, the deep uncertainty poses problems for standard economic assessment tools. One possible approach in this situation is to use concepts from robust decisionmaking. One simple heuristic in this case is that it can make sense to trade a small decrease in the expected performance of a strategy for a large increase in performance in the worst-case scenario. For philanthropic investments, this implies that even if the expected value of a given investment may not be as high compared to other potential investments, it can be worthwhile to have a diverse portfolio and to invest some fraction in climate risk management due to the deep uncertainty and the potentially severe negative impacts.

Integrated analyses

There is a large and growing body of research focusing on specific climate change effects. This is important, as it provides a foundation for our understanding of the Earth system. However, it is also important to understanding how these effects interact. These interactions are typically less well studied. Example of such interaction effects include the interplay between (i) sea-level rise and adaptation (discussed above) and (ii) the ability to adapt to climate change and the motivation to reduce greenhouse gas emissions and/or deploy geoengineering.

Funding for integrated research is coming in part from federal agencies such NSF (which funds SCRiM). Wealthy individuals are also known to support this kind of research.

Other people for GiveWell to talk to from the SCRiM network:

- Juergen Scheffran (http://www.uni-hamburg.de/geographie/personal/professoren/scheffran/index.html)
- David Anthoff (http://www.david-anthoff.com/Pages/default.aspx)
- Robert Lempert (http://www.rand.org/about/people/l/lempert_robert_j.html)