Who shares similar experiences of climate change in a 1.5 C world and beyond?

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A new framework to understand how uneven the effects of a 1.5°C world are for different countries around the world has been published today in *Geophysical Research Letters*, led by researchers from the

Environmental Change Institute (ECI) at the Oxford University Department of Geography.

It has been long understood that climate change will affect some regions more severely than others. However, quantifying these differences in a consistent way across many indicators of climate change has proven difficult in the past, mainly due to differences in how these metrics of climate change are defined.

Lead author Dr. Luke Harrington, a Postdoctoral Research Associate at the ECI, explains: "Our paper takes a different approach, by looking at what changes are expected for one specific region after a certain amount of global warming, such as the Paris Agreement's 1.5°C threshold above pre-industrial levels. We then use climate models to identify how much global temperatures need to rise for different locations around the world to experience an equivalent level of change. This is what we refer to as the Temperature of Equivalence Index".

As an illustration of the framework, the authors find changes to the severity of extreme heat events for low-income nations after 1.5°C of global warming would not be seen for regions of the world with high-income populations until after a global temperature rise twice as high. 'Our example of low-income nations experiencing more extreme heat earlier than their high-income counterparts is already well-known within the scientific community," says co-author Dr. Andrew King, from the University of Melbourne. "But the novelty here lies in how these results are framed. We can develop an equivalent statement about changes to other types of physical climate hazards, such as extreme rainfall for example, and compare these results side-by-side'.

The authors are now working to expand the TE framework to more impact-relevant metrics of climate change, such as changes to crop yields and exposure to coastal flooding with continued sea level rise.

"Eventually, we hope to develop a tool whereby local decision makers could choose which measures of climate change are most relevant to their individual circumstances, and then identify which other regions around the world are projected to have shared experiences of these same indices under future warming," says Professor Dave Frame, a co-author from the New Zealand Climate Change Research Institute.

"The devil in the detail for this work is what choice of climate change metrics should be used. This is a decision that should not be made by scientists, but instead by local decision makers", says co-author and the ECI's Deputy Director, Dr. Friederike Otto. "Our job is to provide the TE index for an array of climate change indicators as wide as possible, and then let adaptation planners decide for themselves which of these are most useful."

More information: Luke J. Harrington et al. How uneven are changes to impact-relevant climate hazards in a 1.5°C world and beyond?, *Geophysical Research Letters* (2018). DOI: 10.1029/2018GL078888

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