



## **How much can disaster and climate science contribute to loss and damage mechanisms in international climate policy?**

Christian Huggel (1), Simon Allen (1,2), Hajo Eicken (3), Gerrit Hansen (4), and Dáithí Stone (5)

(1) University of Zurich, Department of Geography, Zurich, Switzerland (christian.huggel@geo.uzh.ch), (2) Institute of Environmental Sciences, University of Geneva, Switzerland, (3) International Arctic Research Center, University of Alaska, Fairbanks, AK 99775-7340, USA, (4) Potsdam Institute for Climate Impact Research, Potsdam, Germany, (5) Lawrence Berkeley National Laboratory, Berkeley, USA

As the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) recently has shown, there is increasing evidence of observed impacts of climate change on natural and human systems. Some of these impacts are negative and result in damage and loss of lives and assets.

In international climate policy negotiations under the UNFCCC the discussions on loss and damage have gained significant traction during the past negotiation rounds. At COP 19 the Warsaw International Mechanism for Loss and Damage (WIM) was created as an institutional arrangement to address this issue. Thereby, loss and damage (L&D) are typically defined as the residual damage and loss that occur beyond mitigation and adaptation efforts. This implies that effective mitigation and adaptation policy can substantially reduce L&D.

While there is wide agreement that knowledge and understanding needs to be strengthened on how L&D due to climate change affects countries, in particular highly vulnerable countries and populations, there is still substantial disagreement on several aspects. In fact, after COP20 in Lima a number of options are on the table, including whether L&D should be located under the adaptation framework or form a separate institutional arrangement, or whether a compensation regime should be established to support developing countries.

Similarly, the scientific framework for a clear L&D concept, its application in real-world cases, and implications for international climate policy, in particular with respect to questions of responsibility, liability, compensation and financing, is still evolving. Earlier proposals, for instance, have included a threshold concept, with payments released upon crossing of certain thresholds of climate (related) parameters, similar to insurance procedures. The threshold would be defined as a departure of the parameter from baseline conditions, for instance a rainfall event that is more intense than a certain baseline based threshold. Further proposals for mechanisms of financing suggested a role of causation and thus attribution of L&D to (anthropogenic) climate change. Yet, causation mechanisms are particularly delicate in terms of climate justice, development and implications of legal liabilities.

Here, we outline potential contributions of science to L&D mechanisms in greater specificity, in particular for (i) threshold based mechanisms, and (ii) causation related mechanisms. We draw on recent concepts of L&D attribution suggesting a more comprehensive attribution framework based on risk concepts. We present a first-order proof-of-concept for the above mechanisms (i) and (ii), using case studies of recent disasters (both related to extreme events and gradual climate change) in the Indian Himalayas, Colombia, Alaska and Australia. We analyze whether science is in a position to substantially contribute to the different L&D policy proposals, including the question whether currently available data and datasets on climate and hazards, exposure and vulnerability are in line with such support, in particular with regards to developing country contexts. We conclude with a perspective on critical research and data needs to further strengthen L&D science and policy.