

# How can research about extreme events and impacts be developed to support international climate policy?

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## 1. Introduction

There is a pressing need to develop climate change adaptation policy, in particular to deal with loss and damage in developing countries. Research into extreme events and impacts has the potential to inform this policy, but it is unclear what kind of scientific information will be most useful. As part of a project investigating the attribution of flooding and drought in Africa, we have been working to understand the loss and damage policy context and the potential role for science, by attending policy meetings, conducting interviews, and facilitating a participatory game.

## 2. Loss and Damage

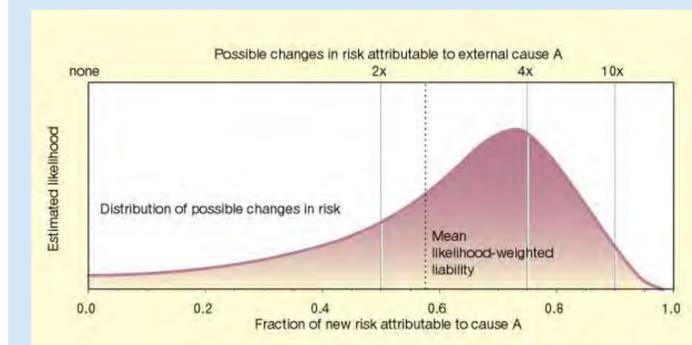
*What is meant by loss and damage?*

In 2013, the Warsaw International Mechanism was established by the United Nations Framework Convention on Climate Change (UNFCCC) to address “loss and damage associated with the adverse impacts of climate change”. After engaging with the UNFCCC secretariat and relevant stakeholders, we have discovered that there has been no formal discussion of what “loss and damage” signifies, with different communities interpreting it in different ways. We are now conducting interviews with key informants to develop alternative “typologies” of loss and damage as a basis for further discussion.

## 3. Attribution of Climate Events

*Is extreme event attribution relevant to loss and damage policy?*

In the last decade, there have been rapid developments in our ability to estimate the influence of anthropogenic drivers, such as greenhouse gas emissions, on specific extreme weather events, including heatwaves, flooding, and drought.



**Figure 2** Event attribution studies generate a distribution of estimated attributable risk (Allen 2003)

Interviews with policy-makers and observers to the UNFCCC process suggest that many are not aware of this research, and there are contrasting opinions about its relevance to the Warsaw Mechanism (Parker et al. 2015). Attribution is often associated with liability and compensation and is therefore sometimes seen as controversial (James et al. 2014). CAULDRON, a participatory game developed with the Red Cross Climate Centre, has been a useful tool to communicate changes in the probability of extreme weather and encourage further dialogue about the role of attribution science in policy.



**Figure 3** Playing CAULDRON in Warsaw



**Figure 1** Typhoon Haiyan was cited as an example of loss and damage, but given “loss and damage” has yet to be defined, it is unclear if this event will be relevant under the Warsaw Mechanism. We still have no hard numbers on how much, if at all, human influence on climate actually contributed to the typhoon.

## 4. Research Gaps

*What are the research gaps for addressing loss and damage?*

The actions and research needed to address loss and damage will depend on its definition. By exploring typologies of loss and damage, we hope to facilitate discussion about what kind of practical actions, and relevant scientific information, might be appropriate under different definitions.

**An inventory of anthropogenic climate change impacts**  
 For example, if the Warsaw Mechanism were to adopt a definition which required attribution to greenhouse gases, an inventory of anthropogenic climate change impacts might be required. Table 1 illustrates what such an inventory might look like using European events as an example. It highlights the large gaps in our understanding of the causal chain between greenhouse gases, meteorology, and economic and non-economic losses, as well as the difficulty of incorporating uncertainty, and reconciling results from different studies (Otto et al. 2015).

**Table 1** A specimen inventory of anthropogenic climate change impacts for Europe 2000–2010, based on the events with the most severe mortality and economic losses as defined by WMO.

Extreme Event	Anthropogenic influence on climate event	Anthropogenic influence on impacts	Anthropogenic influence on economy
UK flooding 2000	Increase in risk	20% increase in risk	?
Italy flooding 2000	?	?	?
Germany flooding 2002	?	?	?
Europe-wide heatwave 2003	Increase in risk by $\geq 100\%$	?	?
France heatwave 2006	?	?	?
Germany storm 2007	?	?	?
Russia heatwave 2010	Increase in risk by 0 to 150%	?	?

## 5. Next Steps

There is a clear need for dialogue between scientists, development practitioners, and policy-makers about what loss and damage means, what action can be taken to address it, and what scientific information might be needed to support this. If you are interested in taking part in this discussion, and/or think your research might be useful in addressing loss and damage, we’d be keen to hear from you.

## References

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