

National inquiry on the impact of climate change on the human rights of the Filipino People

Statement of Resource Person: Myles Allen

Preliminary matters

- 1) My name is Myles Allen, and I am a Professor of Geosystem Science at the Environmental Change Institute, School of Geography and the Environment and Department of Physics, University of Oxford. My research focuses on understanding how human and natural influences on climate contribute to observed climate change and extreme weather risk and using observed changes to constrain climate forecasts and their implications for adaptation and mitigation policy.
- 2) I have contributed extensively to the development of attribution science: In 2003 I wrote an article in *Nature*¹ proposing a framework for attributing harm associated with extreme weather events to large-scale drivers of climate change, including anthropogenic greenhouse gas emissions. The following year, I co-authored the first major study addressing this question using “repurposed” climate change simulations.² In 2011 I led a study applying a more direct approach in which large ensembles of computer simulations are used to evaluate explicitly how risks of extreme weather events have changed between “the climate that might have been” in the absence of human influence, and the climate as observed, including the impact of past emissions of greenhouse gases and other atmospheric pollutants.³ This latter approach has since become the *de facto* standard for “probabilistic event attribution”, and in 2016 we extended it from meteorological indicators alone (extreme heat or precipitation) to proxy indicators of actual harm (estimated numbers of properties at risk of flooding⁴ and heat-related human mortality⁵). I have co-authored a number of articles and book chapters exploring the legal implications of event attribution science.⁶
- 3) I have also contributed more generally to attribution science, most recently as the Coordinating Lead Author of Chapter 1, Framing and Context, of the

¹ M. R. Allen, “Liability for Climate Change,” *Nature*, vol. 421, pp. 891–892, 2003.

² P. A. Stott, D. A. Stone, and M. R. Allen, “Human contribution to the European heatwave of 2003,” *Nature*, vol. 432, no. 7017, pp. 610–614, 2004.

³ P. Pall, T. Aina, D. A. Stone, P. A. Stott, T. Nozawa, A. G. J. Hilberts, D. Lohmann, and M. R. Allen, “Anthropogenic greenhouse gas contribution to flood risk in England and Wales in autumn 2000,” *Nature*, vol. 470, no. 7334, pp. 382–385, 2011.

⁴ N. Schaller, A. L. Kay, R. Lamb, N. R. Massey, G. J. van Oldenborgh, F. E. L. Otto, S. N. Sparrow, R. Vautard, P. Yiou, I. Ashpole, A. Bowery, S. M. Crooks, K. Haustein, C. Huntingford, W. J. Ingram, R. G. Jones, T. Legg, J. Miller, J. Skeggs, D. Wallom, A. Weisheimer, S. Wilson, P. A. Stott & M. R. Allen, “Human influence on climate in the 2014 southern England winter floods and their impacts”, *Nat. Clim. Chang.* **6**, 627-634, 2016.

⁵ D. Mitchell, C. Heaviside, S. Vardoulakis, C. Huntingford, G. Masato, B. P. Guillo, P. Frumhoff, A. Bowery, D. Wallom, and M. Allen, “Attributing human mortality during extreme heat waves to anthropogenic climate change,” *Environ. Res. Lett.*, vol. 11, no. 7, 2016.

⁶ M. R. Allen, “The scientific basis for climate change liability,” in *Climate Change Liability: Transnational Law and Practice*, 2011, pp. 8–22.

IPCC Special Report on a global warming of 1.5°C, with particular responsibility for the assessment of the level of human-induced warming to date and its rate of increase.⁷

- 4) A central issue that the Commission may need to consider is the distinction between two approaches to framing the event attribution problem: assessing how human influence on climate may have affected the magnitude of an event or of the harm caused by an event, assuming that event occurs; versus how human influence may have affected the probability of an event of a given magnitude occurring. In 2012, we demonstrated that the same event could be characterised as “mostly natural” and “mostly anthropogenic” depending on which framing was used, highlighting the importance of clarity of approach to the attribution problem.⁸ This distinction is of particular importance in assessing contributions to the impacts of tropical storms, typhoons and hurricanes, where any change in event-probability remains unclear, but human-induced warming has a well-understood impact on potential intensity and extreme rainfall.⁹
- 5) I have contributed to publications assessing the attribution of changes in large-scale temperatures, sea level and extreme event risk to individual greenhouse gas emissions arising from individual countries¹⁰ or products sold by major corporations.¹¹
- 6) Having led and co-authored papers on the cumulative impact of carbon dioxide emissions on climate,¹² I have argued for a mandatory link between carbon sequestration and fossil fuel extraction as a mechanism for both incentivising the development of carbon dioxide capture and disposal technologies, and a means of imposing the costs and risks associated with carbon dioxide disposal on present-day fossil fuel producers and consumers.¹³
- 7) I agree to be a resource person for the petitioners, following a Skype call with Attorney Hasminah Paudac.

⁷ K. Haustein, M. R. Allen, P. M. Forster, F. E. L. Otto, D. M. Mitchell, H. D. Matthews, and D. J. Frame, “A real-time Global Warming Index,” *Sci. Rep.*, vol. 7, no. 1, 2017.

⁸ F. E. L. Otto, N. Massey, G. J. van Oldenborgh, R. G. Jones, and M. R. Allen, “Reconciling two approaches to attribution of the 2010 Russian heat wave,” *Geophys. Res. Lett.*, vol. 39, L04702, 2012.

⁹ G. J. van Oldenborgh *et al*, “Attribution of extreme rainfall from Hurricane Harvey, August 2017,” *Environ. Res. Lett.* **12** 124009, 2017.

¹⁰ F. E. L. Otto, R. B. Skeie, J. S. Fuglestad, T. Berntsen, and M. R. Allen, “Assigning historic responsibility for extreme weather events,” *Nat. Clim. Chang.*, vol. 7, no. 11, pp. 757–759, 2017.

¹¹ B. Ekwurzel, J. Boneham, M. W. Dalton, R. Heede, R. J. Mera, M. R. Allen, and P. C. Frumhoff, “The rise in global atmospheric CO₂, surface temperature, and sea level from emissions traced to major carbon producers,” *Clim. Change*, vol. 144, no. 4, pp. 579–590, 2017.

¹² M. R. Allen, D. J. Frame, C. Huntingford, C. D. Jones, J. A. Lowe, M. Meinshausen, and N. Meinshausen, “Warming caused by cumulative carbon emissions towards the trillionth tonne,” *Nature*, vol. 458, no. 7242, pp. 1163–1166, 2009.

¹³ M. R. Allen, D. J. Frame, and C. F. Mason, “The case for mandatory sequestration,” *Nat. Geosci.*, vol. 2, no. 12, pp. 813–814, 2009.

Substantive matters

- 8) The overall science of extreme event attribution is well summarised in the statement of Sophie Marjanac, dated 3rd August 2018. In my presentation, I will focus on elements that are specific to the Philippines context or otherwise complement Marjanac's statement.
- 9) A key finding of the recent IPCC Special Report on 1.5°C (SR1.5) was that human-induced global warming has now reached 1°C ($\pm 0.2^\circ\text{C}$) relative to the period 1850-1900 which may be considered approximately representative of pre-industrial conditions (greenhouse gas emissions had already caused some warming by the late 19th century, but this was partly compensated for by the impact of a series of large volcanic eruptions around that time). Hence, given that our best estimated of the net impact of natural climate drivers on global temperature change over the 20th century is small, to a good approximation, all of the observed warming since 1850 can be considered anthropogenic, with about 80% of that warming due to carbon dioxide emissions.
- 10) A second key finding was that, based on the evidence available from current climate models and our understanding of the underlying theory, the probabilities of many potentially damaging extreme weather events, including heatwaves and short-duration extreme precipitation events, increase predictably with rising global temperatures. Hence this provides a basis for relating harm associated with extreme weather events with attributable changes in global temperature.
- 11) The recent paper by Ekwurzel et al demonstrated that it was possible to trace contributions to global temperature change and sea level rise to emissions generated by products sold by specific major corporations, providing a potential framework for the apportionment of responsibility for climate-related harm.
- 12) Emissions are assessed to be impacting the Philippines through rising sea-level and potential changes in risks of high winds and precipitation associated with tropical storms and typhoons. In my presentation, I will specifically address the attribution study led by Izuru Takayabu¹⁴ which demonstrates how the size and impact of the storm surge associated with an extreme typhoon may have been exacerbated by anthropogenic climate change, although no change in the frequency of such events has yet been attributed to human influence.

**Signed:****Myles Allen****Date: 24 October 2018****At: Oxford, United Kingdom**

¹⁴ I. Takayabu *et al* "Climate change effects on the worst-case storm surge: a case study of Typhoon Haiyan", *Environ. Res. Lett.* 10 064011, 2015.