

# Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications

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PREFACE

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The idea of an international symposium focused on ‘Four degrees and beyond’ germinated in late 2008 after discussions with colleagues who were concerned that there was a large gap between the emerging policy target of keeping global warming below two degrees and some of the emissions-reduction scenarios that were being proposed in both the academic and policy literature. Many emissions-policy scenarios had (i) underestimated the rate of increase of emissions in the last decade and (ii) been unrealistically optimistic about when global emissions might peak, given the time it takes to transition out of carbon-based energy systems. A pessimistic, or some might say realistic, appraisal of the slow progress of the United Nations Framework Convention on Climate Change (UNFCCC) process, also suggested that avoiding two degrees would be highly unlikely, and that the chances of warming by four degrees in this century much less unlikely than previously thought. At the same time, the Oxford-based author Mark Lynas had just published his book ‘Six degrees: our future on a hotter planet’, and he had often commented on the scarcity of any scientific literature on the nature and impacts of climate changes larger than four degrees.

So, the Four degrees and beyond conference took place in September 2009, where we asked participants to specifically address the questions of (i) how probable a warming of four degrees or higher might be, (ii) what the consequences of such a warming might be for ecosystems and society, (iii) how to adapt to such large changes, and (iv) how to keep the risk of high-end climate change as low as possible.

The papers in this Theme Issue were written by participants in the Four degrees conference, at the invitation of the editors. In many cases, authors were asked to combine their separate conference contributions into a joint paper synthesizing multiple viewpoints and results. We appreciate their enthusiasm in taking on this challenge.

Now, as we go to press with the Theme Issue a year on from the conference, the results of the research presented in its papers seem even more relevant than a year ago. We have no comprehensive climate-change ‘deal’, and Yvo de Boer, in his final remarks as head of the UNFCCC before stepping down in 2010, said that it could take up to 10 years for negotiations to deliver a robust and effective agreement. Voluntary and non-nation state emissions-reduction

One contribution of 13 to a Theme Issue ‘Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications’.

commitments might give us some breathing space, but still take us closer to four degrees than is comfortable. The papers in this issue that look at impacts and adaptation challenges in a four degrees world are sobering: the possible impacts are large, in some cases, transformational, and the challenges in understanding and developing responses to these impacts considerable. Hopefully, this Theme Issue will stimulate much-needed further research that explores the implications of and solutions to high-end climate warming.

The Four degrees conference would not have been possible without financial support from the Tyndall Centre for Climate Change Research and Oxford University's Environmental Change Institute. Similarly, Maria Mansfield was invaluable, first as conference organizer, and then as editorial assistant for the Themed Issue. My co-editors Diana Liverman, Richard Betts, Kevin Anderson and Chris West valiantly shared the load in reviewing papers, chasing revisions and making final recommendations. Lastly, thanks are due to all those who contributed to the Four degrees conference, the Editor of *Philosophical Transactions A* for agreeing to the idea of this Themed Issue, and Suzanne Abbot, Publishing Editor, for her support and patience throughout.

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