Cluster 3
Theme: Climate change models and response

'Working with uncertainty: models, epistemic plurality and the possibilities of co-production?'

Uncertainty is a key factor for climate policy at international, national and sub-national levels. It has emerged as a 'monster' or 'super wicked' problem for scientists and policymakers alike and its integration in climate change decision-making is very much disputed and debated. From when the concern over human-induced climate change originated, there has been considerable focus on establishing the rate, magnitude and patterns of change, to guide policy responses. From the outset, the attention to uncertainty has been on how to manage – and particularly reduce uncertainty - but the emphasis in this debate has somewhat shifted over the last two decades. Some scientists are now beginning to acknowledge uncertainty as something that one needs to 'work with' and 'work around' rather than a monster that needs to be controlled or tamed. We take this shift as the starting point for our conversation/panel discussion where the invited speakers would be encouraged to reflect on their practice of working with uncertainty, the unknown unknowns and how these boundaries are negotiated, maintained and represented in models, scenarios and projections as well as how are they communicated and translated into policy. We ask: How far and when can modellers and scientists take into account major drivers of socio-economic and political change such as land-use patterns, and distributional factors, which tend to affect climate-related vulnerabilities? Are there ways in which experts can learn from local people's experiences and perceptions of uncertainty and vice versa? What are the dilemmas of scientists around capturing uncertainty and how does it shape the science/policy interface? We are also interested in exploring opportunities, instances and possibilities where scientists have worked with other forms of knowledge systems (citizen science, indigenous knowledge) and explored the possible pathways of knowledge co-production.

Theme leads
Lyla Mehta and Shilpi Srivastava, Institute of Development Studies

'Unpacking uncertainty and climate change from above.'

There is now a growing community of natural and social scientists as well as boundary and policy actors working to develop approaches to better reflect the 'deep uncertainty' in relation to climate change. We focus on how climate scientists and experts conceptualise uncertainty, the dilemmas of scientists around capturing uncertainty and how it shapes the science/policy interface. These issues are discussed drawing on empirical research with a range of climate scientists from Europe and India. Our research shows that while there has been significant progress in embracing uncertainty as a 'wicked problem' in climate science, large gaps exist in the understandings across the different groups, due in part to different starting points, different epistemological traditions, and different priorities. Most scientists acknowledge uncertainty and there are signs of increasing acknowledgement of 'deep uncertainty' as well. They also appreciate local understandings of uncertainty and the need for local expertise to inform climate models, however scientific focus remains on 'perfecting' models, rather than embracing alternative forms of knowing. At times there are also tensions due to the divergent and shifting priorities of policy makers and politicians. We explore some of these epistemological and practical tensions in our presentation.

Panel
Kasia Paprocki, London School of Economics

'Opportunity/Crisis: On Climate Change and the Politics of Uncertainty in Bangladesh.'

If uncertainty is 'worked with' and 'worked around' in understanding and responding to climate change and environmental hazards, then it is also often produced and practiced to shape landscapes and communities. Uncertainty is not a static condition. It is mutable and negotiable. It changes as it traverses different research programs and policy dialogues. It

is often both cause and result of contestation. Confronted with the existential threat of ecological collapse, how do the politics of uncertainty shape decisions over where and when there is no hope and no possibility of return? I suggest that uncertainty can be practiced in both the presence and absence of information. The idea of uncertainty does work when it comes to planning how to adapt to climate change. Who does it do work for? I consider the politics of uncertainty embedded in the production of knowledge about climate change in Bangladesh, arguing that uncertainty about ecological change in the region is claimed, produced and mobilized to pursue particular visions of developed futures. In so doing, I highlight the instability of the categories of certainty and uncertainty and how knowledge is enrolled in the production of each. Both are subject to interpretation and manipulation, and always in flux.

Teresa Armijos, School of International Development, University of East Anglia
Jeremy Phillips, School of Earth Sciences, University of Bristol

'Making sense of uncertainty in a volcanic context: how storytelling, hazard modelling and music help scientists and communities live and work with uncertainty in Montserrat.'

In this presentation, we analyse how scientists and communities have made sense and coped with uncertainty during a long-lived volcanic eruption in Montserrat. Uncertainty permeates everything in a volcanic context - from when it will erupt, to how big it will be, to when it will finish. Thus, decision making (individual, institutional, scientific or political) responds to changing levels of uncertainty as much as forecasts. People and scientists make sense of this in similar ways and can (and do) learn from each other. We show how models, data and music provide useful boundary objects around which to focus those discussions. To do so, we will present different approaches to characterising and making sense of uncertainty or assessing hazard by looking at how modellers quantify and understand uncertainty in forecasting volcanic activity, how scientists make sense of a crisis through storytelling and communicate volcanic hazards and how communities cope with extreme environmental change

through music. Moreover, by providing a reflexive analysis of narratives and the language used by scientists and communities, we show that not only modellers predict. Scientists, and local residents do it in order to make sense and cope with change in the long term. Our aim with this presentation and reflexive narrative analysis is not to distinguish the physical or social science characterisation/quantification of uncertainty but rather to present the perspective that physical and social scientists are well aware of the difficulties of engaging with stakeholders and communities and are thinking beyond naïve attempts at quantification. These reflections are the result of more than five years of collaborative and interdisciplinary work through which we have explored ways in which experts can learn from local people's experiences and perceptions of uncertainty and vice versa. Our methods include the use of the creative arts and citizen science. We suggest that a possible pathway for knowledge co-production for uncertainty is to look at the hazard assessment process in reverse, starting from the desired hazard or development outcome. Mapping 'backwards' through decisions to be made helps all stakeholders understand where uncertainty permeates and influences these decisions and pinpoints ways in which positive outcomes can be achieved even in the face of significant temporal and spatial uncertainties.

Krishna AchutaRao, Centre for Atmospheric Sciences, IIT Delhi

'Uncertainties in understanding drivers of climate change over India.'

Uncertainties are not only present in modeling future climate outcomes but also in our understanding the past changes and modeling the present. These uncertainties have been traced to (among other things) observational uncertainty, that results from an inadequate system of observing and synthesising observations. This is an acute problem whether dealing with both global and regional (where it becomes more acute) climate change. From climate change studies carried out over India, the effect of local drivers – including irrigation as a major influencer on the climate are now becoming evident. But this is again subject to uncertainties resulting from a lack of adequate measurements. As

irrigation is intimately tied to food security and agricultural policy that impacts a vast population over India, future actions will have an added set of uncertainties to grapple with. In this talk I will be walking through some recent work on understanding the drivers of climate change over India and raise a set of questions for the future of irrigation.

Theme: Disease Outbreaks and Preparedness

Approaches to pandemic preparedness, even those that aim to be 'proactive', focus on a particular aspect of limited knowledge or incertitude: risk, a situation in which we know what the outcome is, and we know the likelihood of it happening. Preparedness efforts focus on turning uncertainties into risk through surveillance, prediction, early warning, and scenario planning. Disease emergence and outbreaks, however, are part of complex systems defined by non-linear ecological, social and technological dynamics: surprise, limited knowledge and ambiguity are thus pervasive. Disease threats and outbreaks involve events whose character and occurrence cannot be predicted in advance (Stirling 2010, Leach, Scoones and Stirling 2010, Stirling and Scoones 2009). The experience with avian influenza and other diseases has shown that surveillance and other pre-emptive strategies have failed to predict emergent threats (Scoones 2010).

In this panel we will discuss at least three different levels of uncertainty. Firstly, in the situation where there is a given disease outbreak, there are uncertainties that arise in terms of where the disease will unfold, which populations will be most affected, and what the effects will be. Secondly, considering a particular disease with epidemic potential, there are ongoing uncertainties regarding where the next outbreak will occur and how this might unfold. Thirdly, there is the situation of extreme unknowns: which disease X might emerge in the near future, how might organisms be mutating, and how can preparedness be maximised?

In response to these different layers of uncertainty, global and national preparedness architectures prioritise the intensified collection and use of scientific, public health and epidemiological data, with strategies such as surveillance and modelling of disease occurrence and spread, supported by clinical and laboratory information as well as novel (e.g. digital) means to collect and share it. Alternatively, preparedness and response mechanisms that recognise and live with uncertainty could be useful: flexible institutions, ongoing iterative adaptation and learning and capacities to anticipate would be valuable strategies identified by social

science (Roe 2013). Furthermore, forms of technical knowledge and innovation must be contrasted and merged with lay expertise: communities' social knowledge and everyday experiences of responding to unpredictable adversity that may offer new and transformative insights. Is there thus scope for incorporation of different knowledges about disease and its emergence, ascertaining what is known, by whom, and how, and how different states and forms of knowledge might interconnect?

Questions
- What are the assumptions around risk and uncertainty within initiatives to predict and respond to disease emergence?
- How do different pandemic preparedness and response institutions deal with the different levels of uncertainty? What are the consequences of this?
- What might be alternative responses that recognise uncertainty?
- How might different kinds of evidence and forms of knowledge contribute to preparedness and response efforts?

Theme leads
Melissa Leach, Institute of Development Studies
Hayley MacGregor, Institute of Development Studies

Theme chair
Melissa Leach, Institute of Development Studies

Panel

Hayley MacGregor, Institute of Development Studies

'"Preparedness from Below": Who is being prepared for what, and by whom?'

Concern about deadly diseases with pandemic potential has grown significantly. As a result, the concept of disease 'preparedness' has shot to prominence in global health policy, where very particular framings of risk and uncertainty can be traced. We hypothesise that, in order to achieve more effective preparedness for future infectious disease outbreaks, an approach is required that includes perspectives from local communities in

potentially affected areas, exploring their responses to uncertainty in the form of everyday threats to health and life. Such experiences and strategies would provide an alternative view on how preparedness might be understood and mobilised 'from below', and what factors might be considered salient to achieve better preparedness at local and other levels of outbreak response. This bottom-up perspective has to date been largely neglected in discussions of preparedness.

We will present the proposed methodology for a new Wellcome funded project, where we ask what can be learnt from those who live with uncertainty in four rural communities in Sierra Leone and Uganda respectively. In this research we will explore how people might draw on formal and informal institutions, forms of public authority, social relations and practices as they anticipate and respond to disease and other threats on a daily basis. In our presentation we will also give examples from the existing ethnographic record of local-level responses to disease as a form of misfortune, and principles and practices that can be identified related to adversity in other aspects of everyday life. Finally, we cite examples where outbreaks have been stemmed partly be drawing on community responses, learning and adaption, such as in the West Africa Ebola outbreak. We conclude by asking what the implications are for conceptualisations of preparedness and local-level scenario-planning, as well as for the place of anthropological insights in shifting how preparedness might be framed.

Santiago Ripoll, Institute of Development Studies

'Drivers of uncertainty in epidemics from a social science perspective: a comparative study.'

Programs aimed at preventing and responding to epidemics often have narrow/managerial understandings of risk that assume prediction is possible or uncertainty can be managed. Models are likely to be based on linear models of behavioural change, and ignore the social science 'contextual' factors of disease emergence: (i) the structural limitations of the context, (ii) the different socio-cultural conceptions of the diseases,

their aetiology and means of transmission, (iii) the importance of first-hand experience, (iv) the risk calculations of policy-makers; and (v) the historical, political and social relations between the response institutions and the affected communities. Considering these complex and dynamic factors is a necessary step towards epidemic preparedness response that incorporates uncertainty This presentation is based on a literature review on the social and cultural aspects of four diseases with pandemic capacity: Cholera, Ebola, Rift Valley Fever and Influenza, carried out as part of the work of the platform 'Social Science in Humanitarian Action' in conjunction with the United States Office of Disaster Assistance Abroad (OFDA), USAID.

Limor Samimian-Darash, Hebrew University of Jerusalem

'Uncertainty-based technologies in health preparedness.'

I this paper, I suggest making an analytical distinction between the problem of potential uncertainty and possible uncertainty, and accordingly, between distinct responses of risk-based technologies and, uncertainty-based technologies in the broad future-governance problematization. I particularly explore two cases: a smallpox vaccination project conducted in Israel in winter 2002–2003 and ongoing preparations for pandemic flu in 2005–2007. In preparing for the possibility of a future smallpox event, Israeli authorities were anticipating the recurrence of an event that had taken place in the past, and thus both the biological agent and the vaccine against it were known. Preparing for pandemic influenza invoked a different problematic, in which the threat was not possible but potential. Not only do multiple types of influenza constitute a future virus's historical context, but they also provide the foundations for its clinical case definition. In such a situation, an epidemic is virtual, in that the potential for its appearance already exists, and can actualize as different events in the future – that is, as various pandemic strains that may require different types of treatment.

Jimmy Whitworth, London School of Hygiene and Tropical Medicine

It would be nice if we could predict disease outbreaks – where, what and when they will occur. But we can't, and worse, we cannot with any certainty predict how an outbreak will unfold once it has started. Mathematical modellers typically predict how an outbreak will develop, but recognise that their accuracy diminishes rapidly more than two weeks into the future, and that their models need regular revision based on new information. A major source of uncertainty is the behaviour of the affected population. This may be influenced culture, social attitudes, political discourse, opinion leaders, rumour, social and formal media sources at least as much as by communications from the outbreak response itself. Put simply – the behaviour of affected populations will be influenced by the outbreak itself, changes in behaviour will affect the trajectory of the outbreak, and this will again affect the behaviour of the population leading to a constantly evolving interaction between the outbreak and the behaviour of the population. This uncertainty does not mean we should not try to plan and prepare for outbreaks, nor that we should not try to improve our predictive models and incorporate behaviour response components within them. There are principles that we can build on from previous experience and from basic biological principles about disease transmission and pathogenesis in order to develop response plans and preparedness. However, it needs to be acknowledged that these plans are a framework and not a blueprint. They must be flexible and include sufficient responsiveness to be able to adapt rapidly to up to date information from a wide range of sources. This is challenging at many levels.

Theme: Disasters, humanitarianism and emergencies

Reducing uncertainty is a central tenant of disaster risk management. The starting point for research and policy is to reduce uncertainty in knowledge of hazard processes to enable better event forecasting, and on working to improve the communication and social embeddedness of this information. This approach has delivered considerable gains in regions exposed to weather extremes including coastal lands and rainfall dependent agricultural communities.

What kinds of bias or limits to imagination and action might be imposed by an uncertainty frame is seldom considered.

Has risk management been seduced by gains in hazards assessment and modelling made by an uncertainty and overlooked the uncertainties lying behind processes of everyday development that (re)produce uneven experiences of vulnerability/resilience, and shape the ways in which individuals and policy actors navigate the ambiguities of decision-making and social action to reduce risk? Or are these aspects secondary?

What alternatives are there to an uncertainty framing of disaster risk management?

To reflect upon this question, the session brings together a panel of experts working across the research-policy chain from hazards and vulnerability researchers to research translators and practitioners with global experience detailed insights from working with the urban poor in Nairobi, Kenya and post-earthquake reconstruction in Kathmandu, Nepal. Panellists will be asked to consider:
- What focus of research or action is prioritised by an uncertainty reduction lens? For example, are you drawn to specific actors or objects, or timespans of analysis?
- Is this focus enabling or constraining of efforts to reduce risk root causes for the poorest and most vulnerable?
- How does your field of work cope with multiple uncertainties?

- Even if uncertainty has some value as a frame, is it appropriate or to seek to reduce all uncertainty?
- What are the ethical implications for researchers and policy actors that impose or withdraw from an uncertainty lens?

Theme lead
Mark Pelling, King's College London
Adaptation, global

Panel
John McCloskey, University of Edinburgh
Earthquake hazard, global
Alejandro Barcena, Kings College London
Social Scientist, Senegal
Emily Wilkinson
Disasters risk analyst, global
Kate Crowley, University of Edinburgh
Climate risk and resilience, global