Westminster Energy, Environment & Transport Forum

Priorities for the National Adaptation Programme
and addressing climate change

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Speaker: Dr. David Stainforth, Associate Professorial Research Fellow, Grantham Research Institute, London School of Economics

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Revised Title: The Value of Diversity in Approaches to Climate Information for Adaptation Support

I'd like to say a few words about how we should use climate science to provide support to adaptation decisions; that is how to use scientific information to optimise climate sensitive decisions in the context of anthropogenic climate change.

This subject is usually taken to be about climate predictions. Indeed in many adaptation discussions the assumption is that we have reliable projections of future climate, albeit conditioned on some emissions scenario and presented in terms of probability distributions.

But in the academic research community this is not accepted at all and there are multiple approaches to the provision of decision-relevant information. There is no one approach which automatically wins out over all others. Let me outline some of the options.

First is a model-based probabilistic prediction approach. UKCP09 and UKCP18 are examples of this approach. It proceeds on the basis that we think our models have the information within them, to provide relevant probabilistic multi-decadal local forecasts.

The context here is that climate forecasting at local scales is much more challenging than weather forecasting. What you require for a climate forecast, is much of what you require for a weather forecast, and then on top of that for the models to capture the details of changes that occur over multiple decades, for instance the consequences of changing land cover and hydrology, changing cloud characteristics, changes which are not

necessarily verifiable from observations. So there's a whole set of new issues here.

The models that we have today are better than any models we've had before. They're very good, they're very useful, but are they good enough to provide decision relevant probabilities, at local scales? Are they good enough to be able to provide probabilities, that are reliable and different between Oxford and Milton Keynes? Some perhaps think yes, others disagree. This is a source of academic discussion and debate. This is research science.

So what alternatives are there?

Well one alternative is known as the storylines approach. This was the subject of a Royal Society international seminar last year. The idea is that one uses the models not to make predictions but to explore how certain events could look different under climate change. Expert judgement and physical understanding is used to paint a picture of plausible large scale changes such as changing atmospheric and oceanic circulation patterns or changes in land temperatures and soil moisture, and then the models are used to fill in the detail.

It can't necessarily provide probabilities but it can be used to explore specific events, specific weather patterns, with which infrastructure engineers might have some familiarity. For instance the events that led to the 2007 floods in Tewkesbury and many other areas. What could that event look like if it took place in 30 years' time, with the warming that we will see, with changing circulation patterns that we might expect in the atmospheric system, and of course simply with increased atmospheric greenhouse gases.

They can also explore the range of credible possibilities. Whether reliable decision-relevant probabilities are achievable with today's technology is a matter for debate so a range of credible possibilities might be the best representation of current understanding that we can get.

At LSE and Leeds University we have done work along this line in India and the same could be done here. Indeed the Dutch national adaptation guidance has a much greater focus on methods along these lines than is the case in the UK.

But making adaptation decisions isn't all about prediction. Climate, well what is climate? Climate is a distribution of weather. So when taking decisions, the question is what is the correct distribution to use even for today, let alone for the future. We know that the underlying distributions of weather events today are different to those in the 1950s or 1960s but quantifying them at local scales is a non-trivial problem. It turns out that observations can't always enable us to do this.

The point is that at some locations the probability of exceeding some thresholds are changing more than at other locations or for other thresholds. Looking at observations through the lens of specific decisions and vulnerabilities can tell us when and where we know we have relevant information from observations for adaptation guidance. And when and where we know we haven't.

A key advantage of these approaches is that they are user specific. But this is also a disadvantage. The analysis must be done to address specific decisions, specific vulnerabilities. This is not a one size fits all situation where one approach is used to forecast everything and it is up to the decision maker simply to extract the relevant information. So they require investment in expertise much more than computer power. In that sense they are messy.

So which approach is best? Which should you use?

I think the main point I would like to make here today, is that the challenge of climate prediction at local scales is not something that has been resolved. We don't have one robust, accepted methodology. Note that this in no way undermines our knowledge that climate change poses a huge threat to our society. That is clear from basic physical arguments but this is about informing specific, practical, adaptation decisions.

This means, more than anything else, that we need to use a diversity of approaches and providers. If we put all our eggs in one "science information for adaptation" basket and that method turns out to be sub-optimal in some way then the country as a whole is put at risk. If we have multiple different approaches, a diversity of approaches and a diversity of providers of science information, then we’re going to be more robust.

So I'm not today arguing for or against any particular methodology – although I have my views and preferences - but I am arguing for caution regarding the assumption that one method should dominate all others. In this context I am concerned about the dominance of the UKCP approach in the UK.

I would also argue that we get better information by using physical understanding and physical models to study specific vulnerabilities rather than assuming that we can separate climate science from adaptation planning. Climate prediction at local scales is a hugely challenging problem and in the field of climate science for decision-support one size may not fit all.

Thank you