Wednesday 10 June - UK Climate Resilience Webinar Series

Speaker: Dr Freya Garry, Climate Scientist (Met Office), Dr Ed Pope (Met Office) and Dr Tom Denbigh (DEFRA)

How will multiple climate hazards impact UK food over the 21st Century?

Questions from Q&A – Where indicated answers made live can be found on the Q&A recording. Red text - additional answers by Dr Freya Garry.	
How might we extend out to beyond "temp, precipitation and relative humidity" to secondary, tertiary risks i.e. social, economic, political ripples that will require #deepadaptation?	*Live answered* Other audience comments: • This is done in the national Climate Change Risk Assessment which this work and other work in the Climate Resilience programme feeds into. • But as Freya said, it's very challenging!
How are local places/local government treated as a partner/lens/audience beyond "sectors"? With thanks	*Live answered* Other audience comments: • E.g. Bradford District 2/3rd rural, West Yorkshire/North of England - future resilience and wellbeing linked to land, people and prospects...
Paris agreement is listed in you model bullet points. Does this mean models assume we keep below 1.5 degrees? Is this compatible with UK industry (including farming) contributions to anthropogenic carbon emissions?	*Live answered* The UK Climate Projections do not assume this, but other projections might. The projections we show use the RCP 8.5 scenario which assume higher warming by the end of the century than the Paris Agreement target. RCP 8.5 is widely used in risk assessment. Importantly it also allows us to look at a range of warming levels from 1.5°C upwards, so can give information for these levels too.
Early on, it was stated that non-climate drivers of risk are assumed to be constant. How valid is this assumption, and how can the results be interpreted if non-climate drivers have a large influence on the overall risk, e.g. hospital capacity for heatwave mortality, dietary shift for agriculture, etc.	*Live answered* Other audience comments: • This is key for stakeholders planning what to do in the near future! • The non-climate factors are accounted for in the national Climate Change Risk Assessment, which Freya's work feeds into. • The SPF programme is funding the development UK socio-economic scenarios: https://www.ukclimateresilience.org/projects/uk-socioeconomic-scenarios-for-climate-research-and-policy/
How did you decide which UKCP18 tool to use? What could be gained by using additional UKCP tools?	*Live answered*

Was a changing climate & future hazards considered by the government when developing the proposed Environmental Land Management scheme policy?	*Live answered*
As we move into unprecedented 2°C-4°C 'new era' is there a dedicated focus on the impact on farmers/farming community and social systems and their resilience?	*Live answered*
What is the timeline of these case studies? PHE Climate Change and Health Unit leads on the Health Effects of Climate Change in the UK report due 2023 a deliverable under NAP- will be interested in collaborating.	*Live answered*
The NFU have a plan for UK farmers to become carbon-neutral by 2040. How might compound event hazards impact these plans—in particular the plans to increase carbon-content of soils and the plans to grow energy crops?	*Live answered*
(How) do you translate this science to have conversations with diverse farmers about its implications for their (future) practices?	*Live answered* Other audience comments: • Good question…also, or alternatively, how do you co-produce the research to embed societal impact into research design / governance? • It will be important to understand what questions farmers need answering so the exchange of information is two-way. This is why we are working with organisations such as DEFRA to gain understanding of the problems facing farmers across the UK.
	Other audience comments: • The Met Office has recently developed a tool that can determine changes in heatwaves at specific times of the year that may be suitable.
What about population control as well as human diet change? somehow we have to start these difficult conversations in the society and our communities.	From a Met Office perspective, we provide an evidence base for UK and international governments to make decisions about mitigation and adaptation. The scientific evidence shows the most effective way to limit climate change is to make big and rapid reductions in global greenhouse gas emissions. There are many ways that this can be done and there is a host of advice about the action individuals, communities and businesses can take on the UK government's Green Great Britain website (https://www.gov.uk/government/news/green-great-

	britain-week-simple-steps-you-can-take-to-reduce-emissions#advice-for-individuals-and-households). Other audience comments: • Agreed - need to think in whole systems and focus on solutions… Focus on beef/dairy farming interesting given its inherent climate impact… • It is not just about the consumer; it is also about the farming community and their welfare. Similar things happened and still happening in mining and manufacturing. Job losses, different new skills need to be learned, migration, ….
In terms of UK food security, how important is it to also understand how climate risks threaten food imports - e.g. you mentioned the reduced wheat yield both in UK and EU in 2018 in one of your examples.	Other audience comments: • Very important. the last CCRA evidence report covered this in its international dimensions chapter: https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/ccra-chapters/ • It will also be covered in the next CCRA currently in preparation
Is the compound impacts on agriculture published as we are looking for examples of such work for the WGII chapter 13 Europe. I would appreciate the ref. Daniela Schmidt	I have been in touch directly with Daniela since the webinar. We are preparing a publication with these results in.
Is the threshold for heat stress the same for both periods (1981-2000 and 2061-2080)?	Yes, we use the same threshold for each period.
Is it correct to describe the fraction of events as probabilities? If the PPE members were designed to be a diverse set of plausible models, within the model uncertainty, treating the fraction of models that have extreme events as probabilities assumes the models have equal weight. Do you think that is a reasonable assumption?	It is typical to frame risk in terms of a return period, or a probability of an event happening in a set time frame. With an ensemble such as this, which has already been sub-selected to exclude members that are not thought to be plausible, it is a reasonable assumption to give equal weight to each ensemble member.
Do you have a direct link to the Local Government Association LGA?	Personally, I don't have a contact there. If anyone associated would like to get in touch about compound event research please contact me on freya.garry@metoffice.gov.uk
Do you use the daily weather? If so, how are the daily weather generated?	The 12 km projections include daily data as well as monthly averages. The actual time-step of the model (how often the model makes calculations) is much more frequent. If you are interested in understanding how climate models work, check out https://www.carbonbrief.org/qa-how-do-climate-models-work.
To Freya: as a climate expert, do you think we are experiencing a wet cold spring and a wet cool summer now?	It has been a dry spring for most of the UK – you can read more about spring 2020 in this Met Office blog. https://blog.metoffice.gov.uk/2020/05/29/spring-2020-the-sunniest-on-record-in-the-uk/. A more recent blog

if yes, what are the possible impacts on agriculture in the UK? Thank you.	covers the wet start to summer so far: https://blog.metoffice.gov.uk/2020/06/12/why-has-summer-so-far-been-wetter-than-spring/. Other audience comments: • In answer to the question if current weather was having an impact on farming - the answer is yes, some farmers think they may have lost up to 50% of yield potential
In agriculture it will be important to consider knock-on impacts into following seasons	I agree – one of the case studies we look at considers this.
Re compound modelling, have you included post-Brexit impact modelling, e.g., the Welsh Government's analysis of geographic vulnerabilities? https://gov.wales/geographical-vulnerabilities-project-presentation	We are looking only at the climatic changes, rather than socio-economic factors or policy choices.
We must also consider the 'baseline' that we're working with, e.g., historical and widespread sub-optimal ecosystems (anthropogenic drivers), fragmented habitats, drained floodplains (reduced flood amelioration capacity, reduced water holding capacity, buildings built 'in harm's way'), the erroneous assumption that protected sites like Natura 2000 and SSSIs are as good as they could or should be etc. Perhaps the solutions are too difficult given historical drivers and their consequences, so perhaps the solutions are multiple and heterogeneous. Perhaps heterogeneity includes new social solutions, e.g., redefining farming to include new social and ethnic backgrounds, new places - cities, food production 'indoors', basically, enabling 1,000s of new people to make food production a major part of their lives and social systems. The historic, industrial farming models might just be too vulnerable to climate change given their homogeneity	Ecosystems are complex and are being increasingly included with climate modelling through earth system models, though projections will still be dependent on socio- and political choices. In this work we are using high resolution physical climate projections and consider how physical changes to meteorological variables over time (i.e. climate) will affect agriculture. Although there will be uncertainties, especially when looking at a very local level, climate models give very useful information about the broad changes to the climate over climate time scales, and this can drive decision making around mitigation and adaptation choices.
How do these projections take into account the declining soil quality within the UK? These climatic hazards will only exacerbate an already alarming situation.	In this work we are looking at meteorological variables (temperature, precipitation and relative humidity) and how they vary on climate timescales. Land use and adaptation choices may lead to changes in soil quality, but they also depend on socioeconomic and political choices.

Do you have a direct link to the Committee on Climate Change and their Covid19 recovery and resilience advice due out later this month and their adaptation advice due in 2021?	As a climate scientist, I do take a personal interest in all advice relevant to climate change, but our remit here is to provide a scientific evidence base for UK and international governments to make decisions about mitigation and adaptation.
What are the main barriers to change/societal impact? Do we need more evidence of the problems? Or should we focus our efforts on solutions?	From a Met Office perspective, we provide an evidence base for UK and international governments to make decisions about mitigation and adaptation. The scientific evidence shows the most effective way to limit climate change is to make big and rapid reductions in global greenhouse gas emissions. There are many ways that this can be done and there is a host of advice about the action individuals, communities and businesses can take on the UK government's Green Great Britain website (https://www.gov.uk/government/news/green-great-britain-week-simple-steps-you-can-take-to-reduce-emissions#advice-for-individuals-and-households).