European Windstorm

Needs of the Insurance Industry

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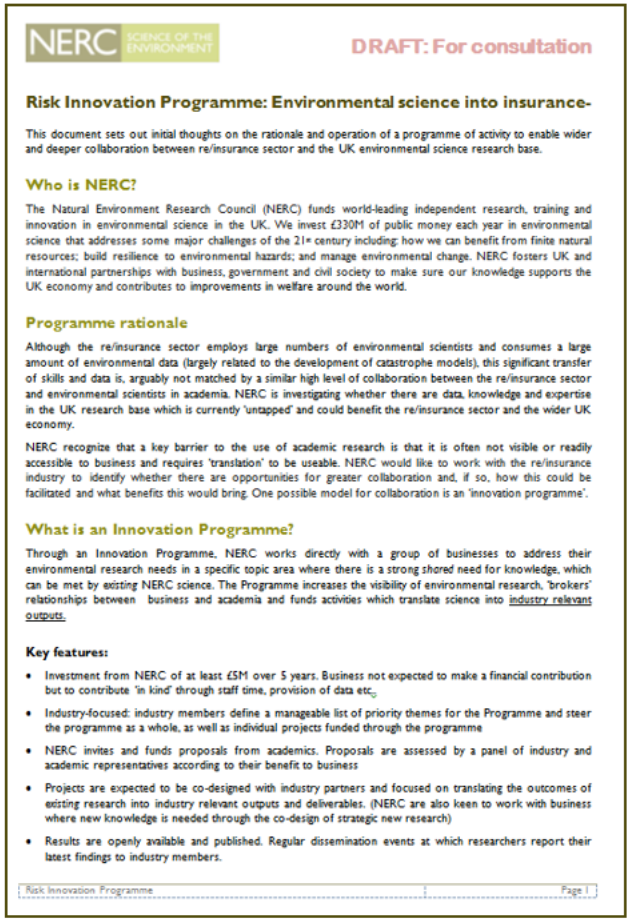
+ a cast of thousands (tens)

Supporting research-insurance collaboration

NERC (Natural Environment Research Council) consulting on structure and mode of operation of a programme to support greater academic-insurance collaboration.

- What are the key re/insurance challenges where environmental science data, knowledge and academic expertise can help?
- Is there appetite from the sector to work collaboratively and openly on these issues?
- What types of collaboration makes sense (for both industry and academia)?
- What outcomes (for both industry and academia) could be expected as a result of greater collaboration?



NERC SCIENCE OF THE ENVIRONMENT

DRAFT: For consultation

Risk Innovation Programme: Environmental science into insurance-

This document sets out initial thoughts on the rationale and operation of a programme of activity to enable wider and deeper collaboration between re/insurance sector and the UK environmental science research base.

Who is NERC?

The Natural Environment Research Council (NERC) funds world-leading independent research, training and innovation in environmental science in the UK. We invest £330M of public money each year in environmental science that addresses some major challenges of the 21st century including: how we can benefit from finite natural resources; build resilience to environmental hazards; and manage environmental change. NERC fosters UK and international partnerships with business, government and civil society to make sure our knowledge supports the UK economy and contributes to improvements in welfare around the world.

Programme rationale

Although the re/insurance sector employs large numbers of environmental scientists and consumes a large amount of environmental data (largely related to the development of catastrophe models), this significant transfer of skills and data is, arguably not matched by a similar high level of collaboration between the re/insurance sector and environmental scientists in academia. NERC is investigating whether there are data, knowledge and expertise in the UK research base which is currently 'untapped' and could benefit the re/insurance sector and the wider UK economy.

NERC recognize that a key barrier to the use of academic research is that it is often not visible or readily accessible to business and requires 'translation' to be useable. NERC would like to work with the re/insurance industry to identify whether there are opportunities for greater collaboration and, if so, how this could be facilitated and what benefits this would bring. One possible model for collaboration is an 'innovation programme'.

What is an Innovation Programme?

Through an Innovation Programme, NERC works directly with a group of businesses to address their environmental research needs in a specific topic area where there is a strong shared need for knowledge, which can be met by existing NERC science. The Programme increases the visibility of environmental research, 'brokers' relationships between business and academia and funds activities which translate science into industry relevant outputs.

Key features:

- Investment from NERC of at least £5M over 5 years. Business not expected to make a financial contribution but to contribute 'in kind' through staff time, provision of data etc.
- Industry-focused: industry members define a manageable list of priority themes for the Programme and steer the programme as a whole, as well as individual projects funded through the programme
- NERC invites and funds proposals from academics. Proposals are assessed by a panel of industry and academic representatives according to their benefit to business
- Projects are expected to be co-designed with industry partners and focused on translating the outcomes of existing research into industry relevant outputs and deliverables. (NERC are also keen to work with business where new knowledge is needed through the co-design of strategic new research)
- Results are openly available and published. Regular dissemination events at which researchers report their latest findings to industry members.

Risk Innovation Programme Page 1

Are you interested in getting involved ? Ruth Hughes rugh@nerc.ac.uk; 07876 545945

Introduction

- Catastrophe modelling is almost 30 years old but remains plenty we don't understand or need to understand more
- Catastrophe models are essentially a series of sensitive levers that lead to huge uncertainty in the resultant output

- What do we want to know more about to help reduce the uncertainty in these levers?
- What else "new" do we want to know that will help aid risk management?
  - Updating cat models
  - Adopting bespoke views of cat models

Question-Collecting Exercise

- 15 insurance industry personnel with meteorological experience representing many companies
- Create working list of questions on European Windstorm that the Insurance industry would benefit knowing from knowing more about
- Prioritise – and revisit potentially on a yearly basis
- Publicly available list, hosted on the Lighthill Risk Network website
- Potential for novel studies that benefit academia, cat model consumers and builders
    - "For the many, not the few"….

Voting Method

- 13 questions: each company has £1000 to "fund" across the 13 questions to split as they see fit
- Tally up "funding" across all X companies

- This is ongoing: will look for more input from those companies we have missed/were not able to attend
- We will revisit yearly, to understand shifting priorities
- Aim to highlights most valuable areas of research that will benefit insurance industry

Caveats

- This list is very much a work in progress: hopefully indicative of areas desired for more knowledge

- Topics here could maybe already have been at least partially done, just needs re-phrasing for a insurance consumption
    - Specific industry-focused "state of the science" documents to help answer certain questions?

- Potential to extend audience for the "funding" question beyond just existing group of meteorology alumni in the industry

"Funding" Scores

THE LIGHTHILL RISK NETWORK IICI

CATIN SIGHT

	Question/Topic	Total	Count
	Is there climate change signal in the current EUWS climate. What might happen in the next 5 years?	£ 412.90	5
*	Natural variability of Europe Windstorms vs. cycles/trends	£ 3,592.90	13
*	Clustering: better understanding on frequency/severity	£ 1,061.29	7
	Improving understanding of EUWS through repurposing pre-existing high-res GCM data	£ 598.39	5
	Correlation between wind and flood risk	£ 1,401.29	8
*	Creation of open source EUWS cat models through academia	£ 832.26	6
	Understanding the impact of choice of climate model resolution on the resultant view of risk	£ 732.26	4
*	Storms in the taill: better understanding limits to EUWS footprints: intensity, size, shape	£ 2,612.90	12
*	Academic data to expand our understanding of historical EUWS	£ 1,248.39	6
	High-frequency low severity wind events (winter and summer).	£ 213.39	3
	Forecasting of storm/flood events (localised level) to help business preparedness, claims handling	£ 32.26	1
	Spatial correlation of hazard (and loss) across different countries	£ 1,088.39	7
	Crossover of hurricane & EUWS seasons. Influence of hurricane remnants on EUWS, now & future	£ 173.39	3

Research work being talked about at workshop

Question 2

- **Natural variability of windstorm climate vs cycles/trends**
- **Last 10-20 years have been relatively quiet. Why? Need to understand this.**
  - **Is this a long-term change or a 20-year signal?**
- **UK's last significant storm was Kyrill in 2007. Is it really interannual variability/random?**
- **France has had many in last 20 years – unlucky or a trend?**
- **Are tracks of secondary lows changing?**
- **Would an ensemble of runs post-1990 show similar behaviour in windstorm activity?**

Question 8

- **Low frequency/high intensity storms in the tail: better understanding the thermodynamic limits to Europe Windstorms and extreme event footprints**
- **How strong can the winds actually be across Europe in a windstorm? And at any single location?**
- **Windstorm intensity and size/shape at high loss return periods: what is a "valid" event?**
- **The sting jet – how frequent is it?**
  - **Does it appear more as the climate models/downscaled output move towards higher-resolution?**
  - **How common is it as you go towards high loss return periods?**
- **Concern that tail event footprints from some vendors don't seem to be realistic in terms of broadness and also track direction**
  - **Second set of eyes from climate models to validate these or otherwise**

Question 5

- **Correlation between wind and flood risk**
- **What is the correlation between wind and flood at both low and high return periods**
- **Can climate model simulation of current climate help?**
- **Idea of "compound events"**
  - **Example of Windstorm Erwin in 2005 where one client reported flood being the main loss in a windstorm event**
- **Are the wettest winters also damaging from a windstorm perspective?**

Question 9

- **Is there existing data from academia that will allow us to expand our historical understanding of windstorms**
- **Are there other sources of historical data/reanalysis that already exist which could be used?**
- **Swiss Re "Forgotten storms" from 20th Century Reanalysis Data**
    - **Find the strongest storms of the past 150 years, produce footprints and potentially the uncertainty around them from re-running reanalysis data**

Question 12

- **Spatial correlation of windstorm events**
- **Different cross-country correlations between vendor models is a big driver of portfolio level loss differences – e.g. for reinsurers**
- **Better understanding of hazard correlation between countries, e.g.**
  - **windspeeds (peak gusts and sustained winds),**
  - **storm counts,**
  - **storm severity index (SSI)**
- **Potential to translate climate research into understanding the multiple aspects of hazard that influence the "amount" of correlation between different countries**

Question 3

- **Clustering: Better understanding on windstorm frequency/severity**

- **Can we use climate models and synthetic event sets from these models to improve understanding of event clustering?**

Question 6

- **Creation of open source European Windstorm cat models through academia**
- **Utility for model validation and comparisons**
- **Potential to piggyback off existing climate model data/operational weather forecast ensemble model data**
- **Focus on hazard: but exposure, vulnerability also required for loss comparisons**
  - **One initiative already underway**
  - **Copernicus project WISC providing storm footprints at 4km resolution, with vulnerability and hazard on OASIS by end 2017 (which takes care of financial modelling)**

Question 7

- **Understanding the impact of choice of climate model parameters on the resultant view of risk and creating guidelines for model-builders**
- **Investigation into the impact of choice of climate model resolution on storm size, shape, type, country correlation**
  - **(Richard Dixon is starting working on this part-time as of June '17)**
- **What is the coarsest resolution of GCM that can still be useful and provide adequate enough data for dynamical (or statistical) downscaling?**
- **Calibration techniques for climate models to find the biases and how to correct them to come up with good downscaled footprints**

Question 4

- Use climate models to improve our understanding of Europe windstorms through repurposing pre-existing high-resolution global climate model runs

- An example of “counterfactual analysis”: what would have happened in a parallel 20th century?
- "Synthetic" high resolution storm sets for validation e.g. footprints to sit alongside vendor models
- What data is out there that we can re-use?
- Potentially redundant question: relevant to several topics here

Question 1

- **Impact of climate change on current climate: Is there a signal? What can we expect in the next 5 years?**

- **Perceived decrease in activity in recent years**

Question 10

- High-frequency events, low-severity (including summer wind events)
- Rarely get detailed loss information from the "attritional" events to calibrate models at short return periods

Question 13

- **Crossover between hurricane season and extratropical windstorm season**
- **Remnant hurricanes that re-intensify over Europe as extratropical storms (e.g. ex-Hurricane Lili in 1996) – could there be tail events that could include this?**
- **Role of warm air associated with Hurricane Floyd in October Storm in 1987 maybe have been responsible for extra strength in this event – is this an issue for early-season windstorms?**
- **Does potential atmospheric/oceanic warming in future extend the crossover region between hurricanes and re-intensifying extratropical systems further NE into the Atlantic?**

Question 11

- Forecasting of storm/flood events (at very localised level) to help with business preparedness, claims handling.
- Rapid development of Europe storms will make it difficult to increase the time element of warnings beforehand
- Improved localised forecasting would help particularly for flood

Current activities

- **NERC Insurance Knowledge Exchange Fellow**
  - Aim: Foster collaborations between the (re)insurance industry and academia to accelerate the uptake and impact of environmental science.
  - Being recruited

- **Bringing science into financing for natural disasters**
  - NERC/DFID/ESRC funding: £2M
  - Collaborative projects between academics and industry/policy/NGO
  - Aim: Apply research to inform the design and development of innovative financing instruments to enable developing countries better respond to and recover from shocks from adverse weather and other extreme natural events
  - Project size & length: 6 months - 2 years, up to £350k
  - Timetable: Networking event: 21 (or 28) July; Closing date: Sept 2017; Projects start: Jan 2018
  - More information: Ruth Hughes, rugh@nerc.ac.uk

NERC KE Fellow

- "Initial discussions with the (re)insurance sector have indicated a growing appetite for open collaboration with academia around issues which are common to the sector."
- "to foster collaborations between the (re)insurance industry and academia, to accelerate the uptake and impact of environmental science within the sector."
- Additional comments re: role?