

The Challenges of Communicating Uncertainty

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'What-if' nightmare scenarios, polling errors headline Trump vs Biden battle

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'What-if' scenarios, polling errors headline Trump vs Biden battle in 2016 and non-toss-up states in the final week before the election



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264 BIDEN
72,102,585 votes (50%)

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PRESIDENT

270 electoral votes to win

214 TRUMP
68,637,070 votes (48%)



48 Dem.

Gained 1 51 se

SENATE

204 Dem.

Lost 5 218 se



US ELECTION 2020 | ANALYSIS

US election 2020: Could the polls be wrong again? It's possible

Henry Zeffman, Washington | Monday November 02 2020, 12:01am, The Times

The most important thing to understand about the presidential election polls is that if they are [as wrong as they were in 2016](#), Joe Biden will be sworn in as president in January. Mr Biden would still win each battleground state even if the polling average in Pennsylvania, Florida, Michigan and Wisconsin were each adjusted by a 2016-sized error.

Long With the Polls This Year?

As many survive for second consecutive presidential cycle, as many survive President Trump and fellow Republicans



Short in 2016. Here's What Voters Learned



The bumpy path to a decisive election

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✓ Gary Peters, Democrat, wins re-election to the U.S. Senate in Michigan > Nov. 4, 2020

TheUpshot

What Trump Needs to Win: A Polling Error Much Bigger Than 2016's

Several factors that led to the misfire last time are no longer in play.



By Nate Cohn

Published Nov. 2, 2020 Updated Nov. 4, 2020

f t e r b 538

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WEDNESDAY JANUARY 6, 2010 40p



**Gadgets
to fight
the flab**

SEE PAGES 24 & 25



**Davina: Why too
much TV is bad
for my children**

SNOW CHAOS

**And they still claim
it's global warming**



Grim conditions for driving in Manchester yesterday

By Martyn Brown

AS one of the worst winters in 100 years grips the country, climate experts are still trying to claim the world is growing warmer.

With millions of Britons battling through snow and ice to get to work today, scientists claim that the cold conditions should not be used as evidence against man-made climate change.

Blizzards, ice and sub-zero temperatures that have gripped the UK for almost a month in a record deep freeze are not "robust" indicators of global weather patterns, they say. Their claims come despite the fact that the rest of the northern hemisphere, from America to Europe and Asia, is

TURN TO PAGE 5

Daily Mail

THURSDAY, JULY 30, 2009

www.dailymail.co.uk

50p



**A mother of three and a brilliant
lawyer ... what does this woman's
suicide tell us about Britain today?**

SEE PAGE 14

WHAT A SHOWER!

**As millions of Britons holiday at home a
promise of a 'barbecue summer', how
the Met Office get its forecast so wrong**



A boating holiday in the Lakes: Seven-year-old Max Preston, from Merseyside, paddles his kayak around the tents on a campsite near Keswick. The campers paddling between flooded tents didn't expect to be told wrong. And the bad news for millions of holidaymakers, none of whom had noted the Met Office's forecast, was that the promised barbecue summer was a distant memory.

Thursday, December 6, 2012 **Sun** 17

SNOWED BLUNDER

Chaos as Met Office gets forecast wrong



Stansted Airport, Essex, had to close

By BEN JACKSON
Environment Editor

were reported. Essex alone had 45 road crashes. The Met Office only warned of light snow on high ground and many roads were not gritted. Forecasters Sarah Holland said: "Snow affected a wider area than we expected."

THREE-DAY FORECAST

TODAY
MAX: 7°C MIN: -1°C
Snow in the North and Wales. Frost, rain and wind later.

FRIDAY

The Nobel Prize
darkest secret

Telegraph

Met Office got it wrong over ban on flights

Conflicting institutional demands for flood forecasts

Greater certainty

*"We believe that there must be a step change in the quality of flood warnings... The **public and emergency responders must be able to rely on this information with greater certainty** than last year"*
(Pitt 2008: vii)

And (?!?)

Lower thresholds

*"The Met Office and the Environment Agency should issue **warnings against a lower threshold of probability** to increase preparation lead times"*
(Recommendation 34: Pitt review)



Error and the Risks of Forecasting

Crying
wolf

Kris Adams
ESTATE AGENTS
Head Office
020 8907 5222
www.krisadams.co.uk

HARROW
TIMES

Thursday, March 9, 2006 www.harrowtimes.co.uk **STILL ONLY 35p** (where sold)

 **Norman Kember is still alive** **Win a 6ft sarnie**
28 Page 5 Competition: page 30 

Scaremongering flood warnings anger residents

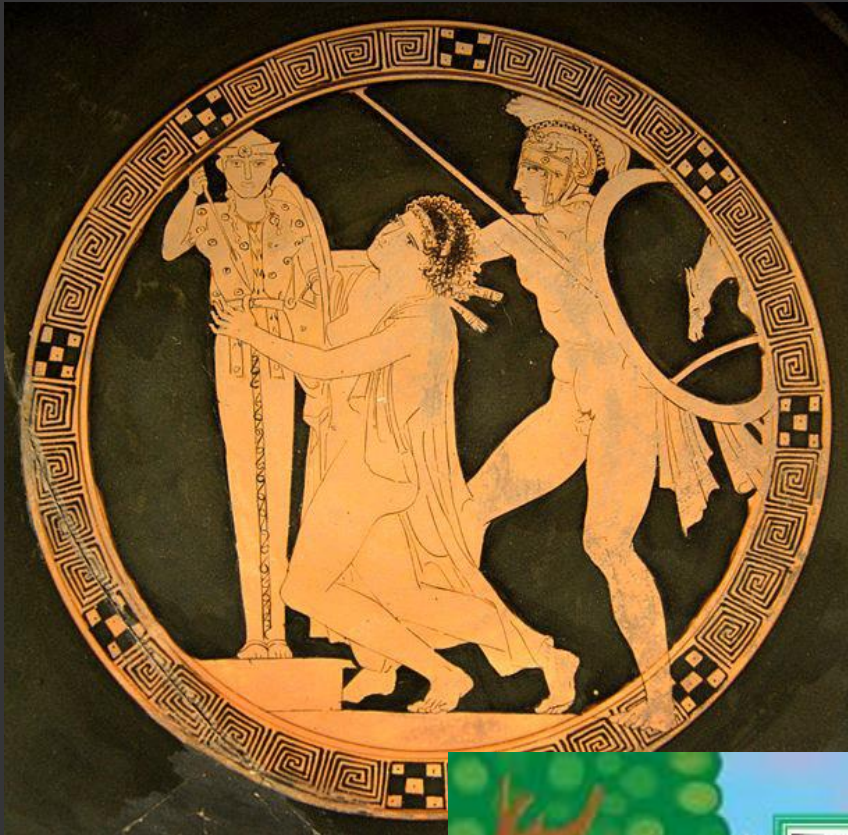
by ALEX MELVIN

"I'm sure the letter could have been couched in softer terms," he said

"There needs to be some sort of explanation or correction."

Error and the Risks of Forecasting





Cassandra of Troy—
her repeated warnings
ignored is dragged away
to slavery by the
conquering Greeks



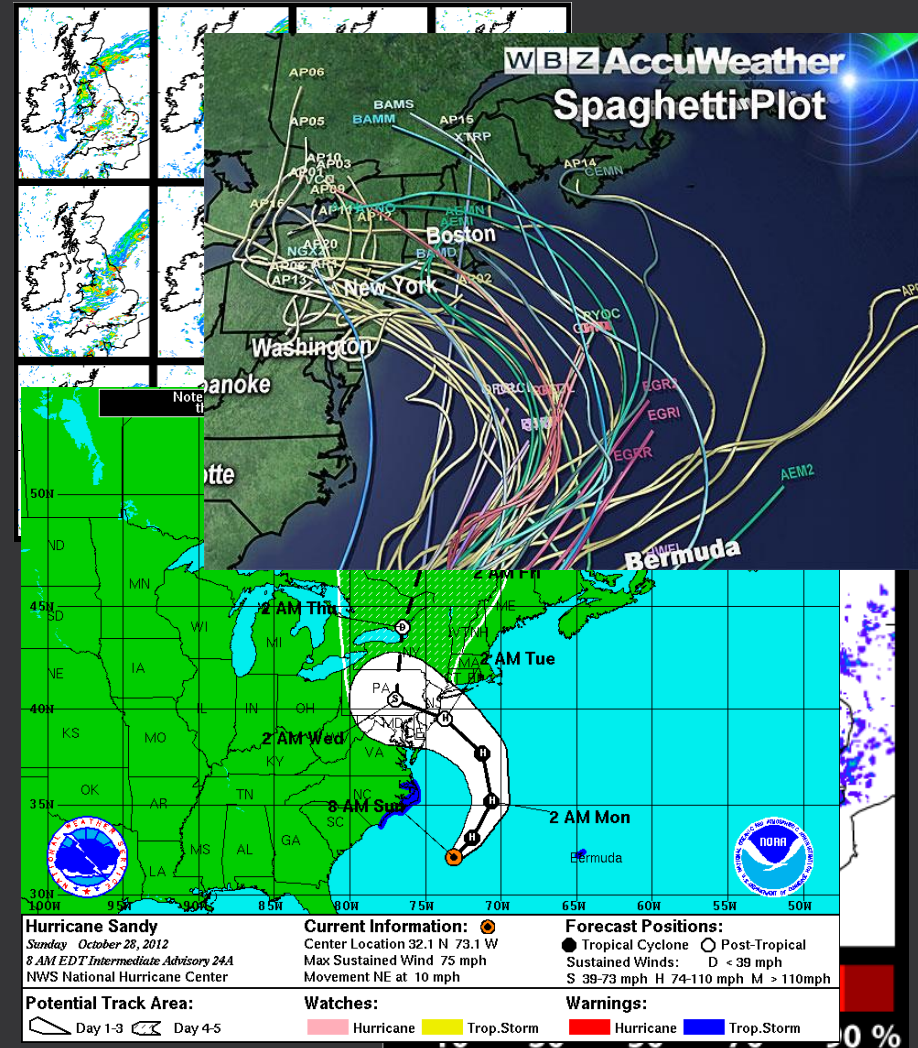
Then one day there
really was a wolf,
but when he
shouted, nobody
believed him

Probabilistic forecasting to communicate & manage uncertainty

‘Ensemble’ technologies to quantify forecast uncertainty
Isomorphic pressures in UK & France to issue risk-based forecasts & warning:

- ensembles are ‘state-of-the-art’
- Shared professional culture of forecasting
- Common reputational concerns

Normative & structural
Impediments?

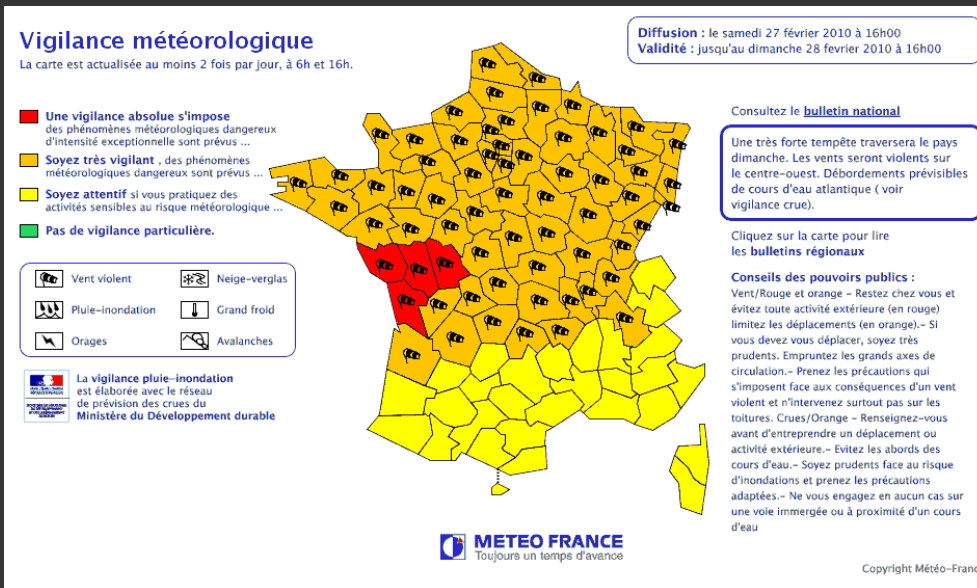


Data & methods

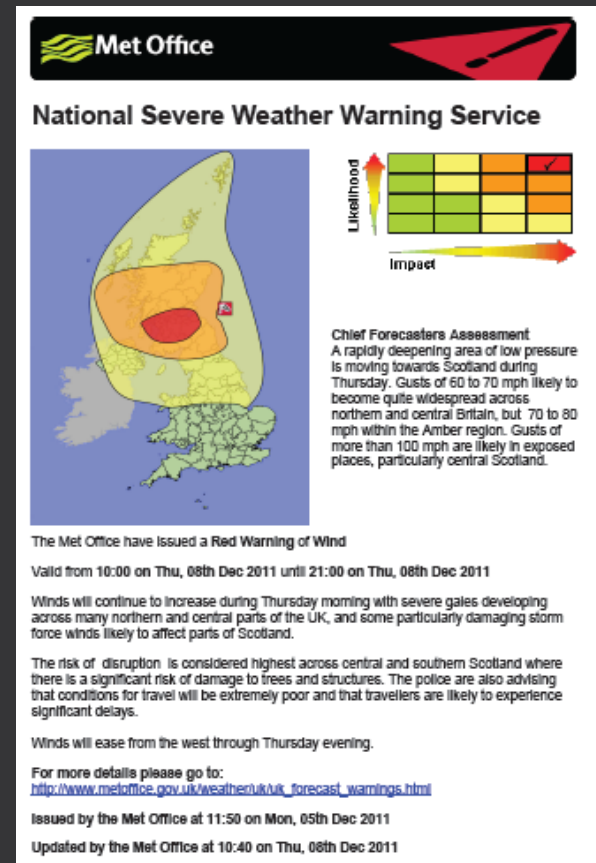
- Review of policy documents, websites, guidance reports, emergency plans, etc.
- In-depth interviews with forecasters and emergency managers in France (n=20) and UK (n=23 + survey of 289 emergency managers)
- Ethnographic observation during repeated site visits to UK Met Office, Météo-France, Joint Flood Forecasting Centre (UK), SCHAPI (*Service Central d'Hydrométéorologie et d'Appui à la Prévision des Inondations*)

Move to risk-based, probabilistic warnings in UK & France

‘Red’ alert for high wind issued before Xynthia



‘Red’ alert issued for Scotland, Dec 2011

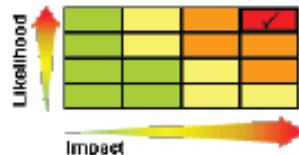
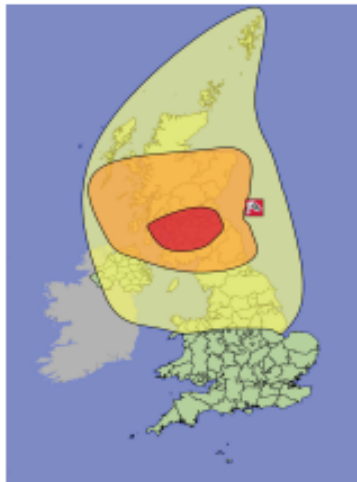


- Similar ‘traffic light’ visualization for increasing risk/hazard
- Based on similar quantitative probability forecasting capacity

UK Met Office explicitly risk-based:



National Severe Weather Warning Service



Chief Forecaster's Assessment
A rapidly deepening area of low pressure is moving towards Scotland during Thursday. Gusts of 60 to 70 mph likely to become quite widespread across northern and central Britain, but 70 to 80 mph within the Amber region. Gusts of more than 100 mph are likely in exposed places, particularly central Scotland.

The Met Office have issued a Red Warning of Wind

Valid from 10:00 on Thu, 08th Dec 2011 until 21:00 on Thu, 08th Dec 2011

Winds will continue to increase during Thursday morning with severe gales developing across many northern and central parts of the UK, and some particularly damaging storm force winds likely to affect parts of Scotland.

The risk of disruption is considered highest across central and southern Scotland where there is a significant risk of damage to trees and structures. The police are also advising that conditions for travel will be extremely poor and that travellers are likely to experience significant delays.

Winds will ease from the west through Thursday evening.

For more details please go to:

http://www.metoffice.gov.uk/weather/uk/uk_forecast_warnings.html

Issued by the Met Office at 11:50 on Mon, 05th Dec 2011

Updated by the Met Office at 10:40 on Thu, 08th Dec 2011

Likelihood



		X	

Impact



Warning level determined by estimated impact, not physical phenomena:

e.g. 70mph wind in Scotland=yellow
... in London = red

Blame and the institutional appeals of probabilistic warnings in UK

Page 18
Daily Mail, Friday, July 07, 2011

 Environment Agency

We can't always stop rivers flooding, but we can warn you in advance.

Daily Mail

New Met Office forecast system likely to mean 80% chance of confusion

Met Office says it will 'empower people to make their own decisions'

By TAMARA COHEN
UPDATED: 04:33 EST, 10 November 2011

[Comments \(108\)](#) [Share](#)

 0  10  21

As many a forecaster will cheerfully admit, predicting the weather isn't an exact science.

But the Met Office is about to try to make it that little bit more precise with a new format.

Rather than telling us that rain, sun or snow will be 'likely' or 'very likely', they will use percentages to describe the probabilities of what the weather could be.

Met Office

Before now we said yes or no, you are going to flood or not. To me, that's where the Met Office have always coped better with things. In the Met Office, all their weather warnings always come out as probabilistic. So when it doesn't happen, they **never have any complaints** because they always say we only said it was a 60% chance and so it hasn't happened... So I think for our **own reputation as well, to go to probabilistic forecasting would be quite useful** because it almost gives us, not an excuse exactly, but it gives us a reason. It quantifies our uncertainty and it means **we won't necessarily get criticised as much.**" (UK flood forecaster at Environment agency)

‘Impacts-based’ warnings praised

- “I think it works. It's universal. I think people are used to working in that kind of scheme.” (UK emergency manager 21).



- More proportionate, fewer false alarms
“we were getting too many, whereas now we don’t get as many so it’s more effective. You know if it comes, it’s serious” (UK emergency manager 11).
- Empowering decision-makers:
 - “You’re putting the onus on the people that receive that probabilistic warning to make a decision what to do with it themselves.” (Environment Agency official)

BUT...

Risk-based early warnings don't prompt early preparedness action

Emergency responders “very reactive in what we do” (Int. 7):

“It's the **probability we respond to**” (Int 16), not the risk or potential impact

“I **don't need information 3 days ahead**. What I need is accurate information the same day or just before . . . that is really valuable to me” (Int. 12)

Little room for discretion or tolerance of uncertainty:

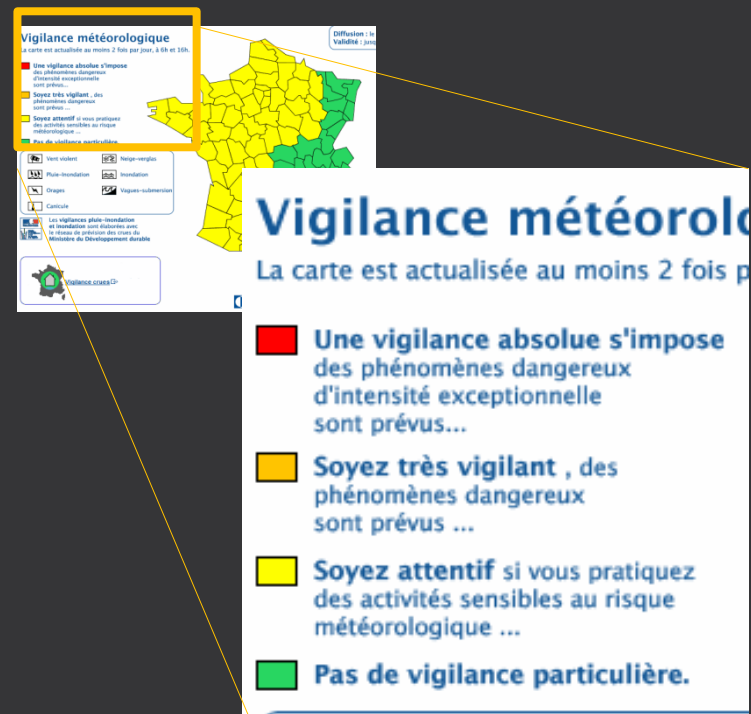
“the Force Incident Manager (FIM) receives notification of early warning of severe weather up to 3 days in advance. FIM should monitor warnings until 24 hours prior to expected severe weather...to see if prediction is confirmed.. **Once prediction is confirmed, then actions triggered**” – Lancaster City Council severe weather plan



Why so little pre-emptive action in response to risk information in UK?

1. **Blue light culture of responding:** “If you were to ask a fire-fighter, they would probably say well, at the end of the day, I'm coming to work come hell or high water and I'll just deal with whatever we get hit with. To be honest, we just react to the information that they're sending” (UK emergency manager 17)
2. **Blame management & risk aversion:** “If we drop a bollock during an incident, it can finish you as an organisation” (Int. 4) “You have to have an audit trail of everything you do in an emergency” (Int.11)
3. **Institutional focus on statutory compliance:** reluctance “to try something locally that would have been outside the national guidance” (UK forecaster 2).
4. **Resource constrained conservatism:** “quite reluctant to commit resources until they actually see something happening on the ground. Even though we might be really confident about something quite significant happening, they don't do anything until they see the wind blow trees down and things like that” (UK forecast 2).

French vigilance system: hazard-based



Red: “Utmost vigilance is required; forecasts call for exceptionally *intense dangerous* phenomena”

Amber: “Be extremely vigilant; forecasts call for *dangerous phenomena*”

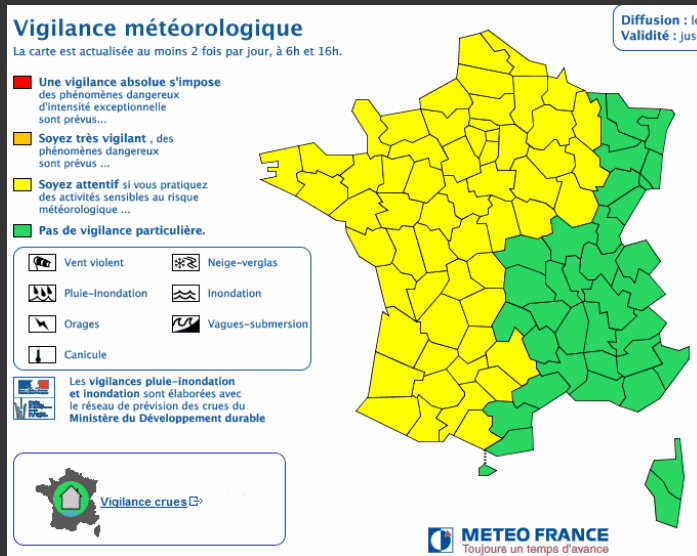
Yellow: “Be careful; forecasts call for phenomena that are usual in the region but may be *dangerous occasionally*”

Green: “No particular vigilance required”

Issued to prevent/ avoid hazards altogether:

“giving an idea of the meteorological risk for the next 24 hours...the information is communicated to authorities in order to alert the population or to *prevent the population to be exposed* to subsequent problems” (French forecaster 3)

Map scale determined by political, not meteorological, geography



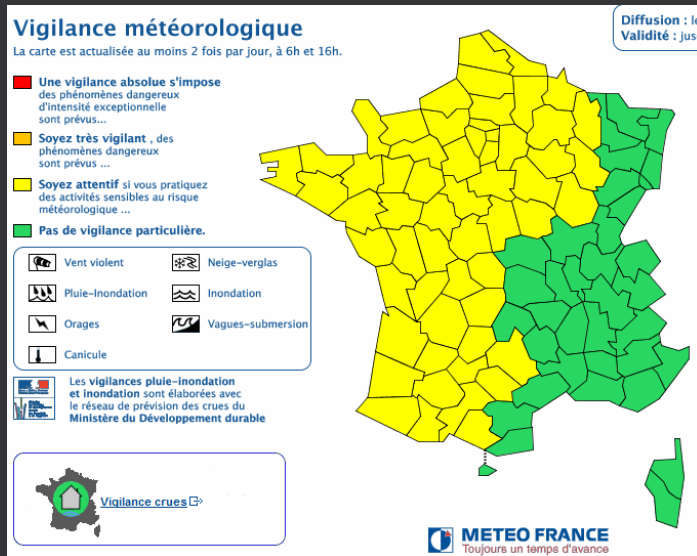
Departmental spatial scale

Short (24hr) time horizon

1. Little forecast error at that spatio-temporal scale

“When the chef forecaster makes a 24hr vigilance, we are trying to reduce to the minimum false alarms. I can’t recall a red vigilance where nothing happened... At the moment, with the vigilance, there are *very few false alarms*, but we also need to work on *avoiding missing events*, or non detection, we should limit them as much as we can” (French Meteorologist 2)

Map scale determined by political, not meteorological, geography



Departmental spatial scale

Short (24hr) time horizon

1. Little forecast error at that spatio-temporal scale
2. Fire alarm function, not early pre-emptive action

“Well, it is also very linked to how France works institutionally. We have a departmental prefect who is responsible for the security of the department. He **wants to know, in his department, at every moment, what it is likely to happen.** It is really the administrative structure that gives this découpage. Whatever happens in the next department: he has his department and he is responsible for that department so the overlapping is not a concern” (Meteorologist 1)

French emphasis on risk prevention, not preparedness & resiliency, as in UK

“well, for us here in the commune, the emphasis is to **elevate the current dike** and we are also looking to instate regulations that will force new houses to be built 2.5 metres above the ground so they can **avoid being flooded**. So having longer-term forecasts about potential risk is not the most practical solution for us I would say” (Mayor 1).



Limited appetite in France for early warning or probabilistic forecast info

Hierarchical state structures require deterministic warnings and certainty

“Having more lead time would be very nice, but I’m not sure it would help me much as a fire fighter. When the CODIS tells me **what to do in the next hour** it is only based on clear and precise information, so we **can’t have too hazy information**. It needs to be clear (fire fighter 1)”

“By forcing forecasters to provide deterministic predictions, the **accountability remains entirely on the shoulders of forecasters**. If a forecaster provides a probabilistic forecast, they give the import for the decision to forecasts users. ... Asking for a deterministic prediction is also a way for the person in charge of taking a decision to avoid **decisional problems and blame**.” (Flood forecaster, France)

Paternalism among state officials about capacity of the public to cope:

People cannot deal with uncertainties, it is too complicated. To go for a walk, to know whether we go to the picnic or not, we could cope with it. However, **when it is time to decide whether we evacuate or not, it is another story**”. (FF, France)

Conclusions

Broad embrace of risk concepts in forecasting and severe weather warnings in UK & France

- similar traffic light model for warnings
- same technological drive towards quantitative probability forecasting

Shaped by different norms of emergency management:

- UK emphasizes preparedness & risk-taking in the face of uncertainty and danger
- France emphasizes risk prevention & authoritative definitions of safety and hazard

In practice, preparedness response to early warnings limited in both UK & France, but for different reasons

Questions?