



LEARNING TO MANAGE CLIMATE RISK FOR COMPLEX SERVICES

Interdependencies, cascade risks
and communication

AGENDA

- Digital Climate Risk Management Overview
- Dealing with Interdependencies
- Thinking through the Cascade Risks
- My first go at Digital Climate Risk Tooling
- Getting Climate Risk onto Execs Radars



PART 1 - DIGITAL HEALTH'S CLIMATE RISK

ENVIRONMENTAL & DIGITAL RISKS = BIG PROBLEM!

FIGURE A

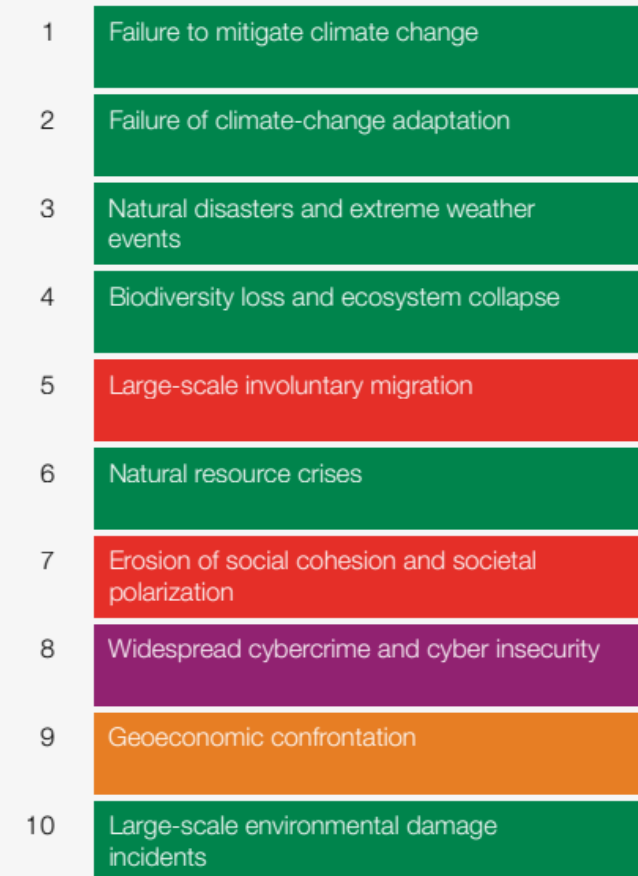
Global risks ranked by severity over the short and long term

"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period"

2 years



10 years



Risk categories

Economic

Environmental

Geopolitical

Societal

Technological

THE BIG CLIMATE RISKS FOR DIGITAL AND HEALTH



H1. Risks to health and wellbeing from high temperatures

H2. Opportunities for health and wellbeing from higher temperatures

H3. Risks to people, communities, and buildings from flooding

H12. Risks to health and social care delivery from extreme weather

H13. Risks to prison and education services from extreme weather

H7. Risks to health and wellbeing from changes to indoor and outdoor air quality

H8. Risks to health from vector borne diseases

ID9. Risk to UK public health from climate change overseas

H10. Risks to health from poor water quality or supply interruptions



I13. Risks to digital from high and low temperatures, high winds, lightning (I13)

I1. Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures (I1)

I2. Risks to infrastructure services from river, surface water and groundwater flooding (I2)

I3. Risks to infrastructure services from coastal flooding and erosion (I3)

I7. Risks to subterranean and surface infrastructure from subsidence (I7)

ADAPTATION PLANNING IN DIGITAL AND HEALTH

tech^{UK}

**THE UK'S CORE DIGITAL
INFRASTRUCTURE: DATA CENTRES**

**CLIMATE CHANGE ADAPTATION
AND RESILIENCE**

Voluntary submission to DEFRA on behalf of the ICT (information, communications and technology) sector under the Adaptation Reporting Power (second round of reporting) as defined by the 2008 Climate Change Act



MY CLIMATE RISK MANAGEMENT OBLIGATIONS

Lots in Black and White!

- HMT Green Book (Business Case) – Accounting for the impacts of Climate Change
- HMG Greening Government Commitments – CCRA/management plan
- Tech Code of Practice Spend Controls – Resilient Tech programmes
- Health and Care Act – Achieve Climate Change Act



SOME COMPLEXITIES TO PONDER

- **Chain of connectivity** - as strong as the weakest link (geographically dispersed, multi-owner network)
- **Unit of assessment** - organisation, process, building etc? - programme/process framing is unusual
- **Burden/proportionality** – how big a problem is this!?
- **Best standard(s) to choose?** - BS8361/ISO14090/CCC Adaptation framework



PART 2 - INTERDEPENDENCIES

How risks amplify each other....

'Resilient Digital is Reliant on...?'

IF ONLY FOR A 'SIMPLE' PROBLEM(!?)

City of London Adaptive Pathways Study

City of London Climate Adaptation and Resilience Planning

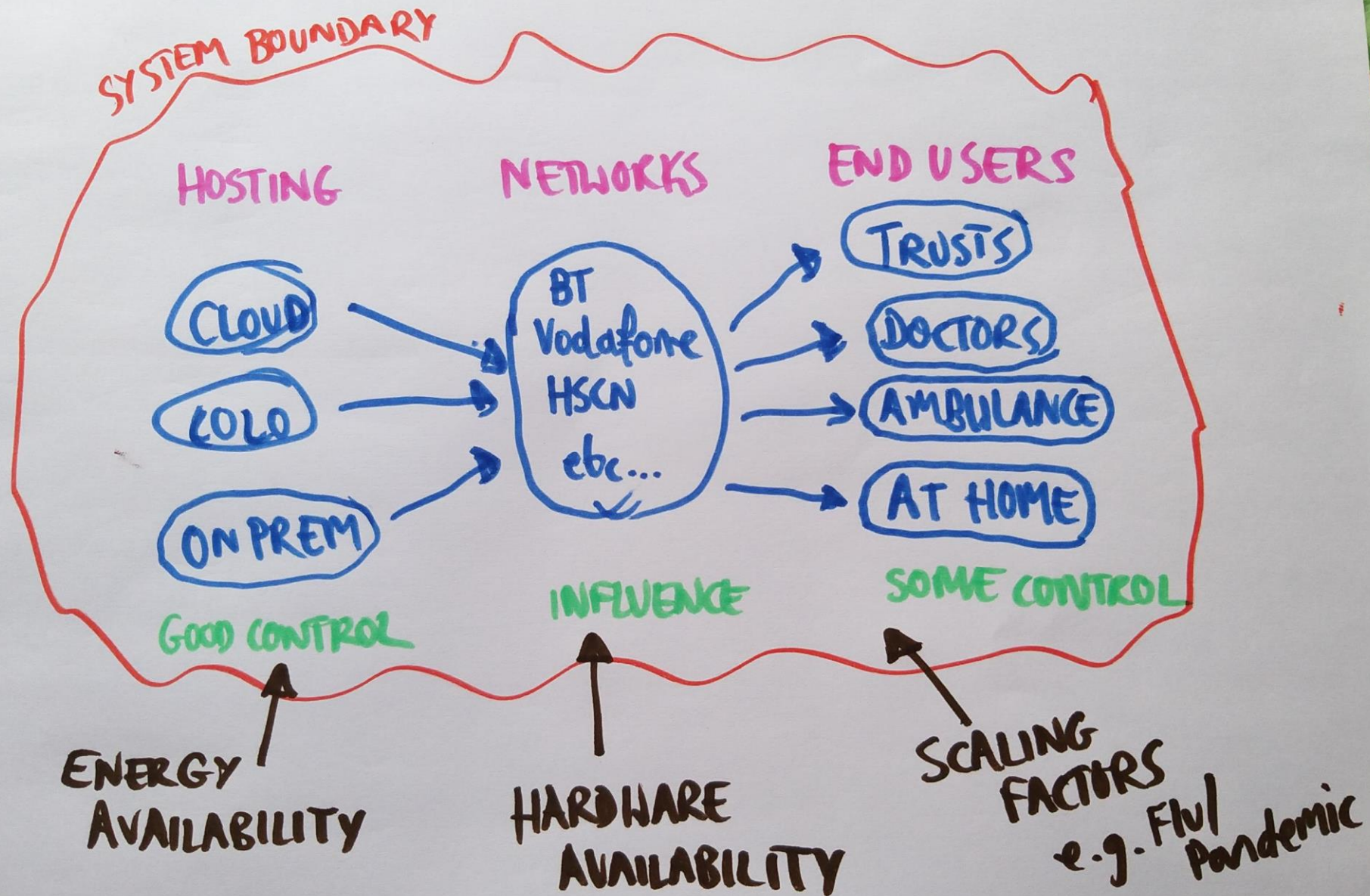
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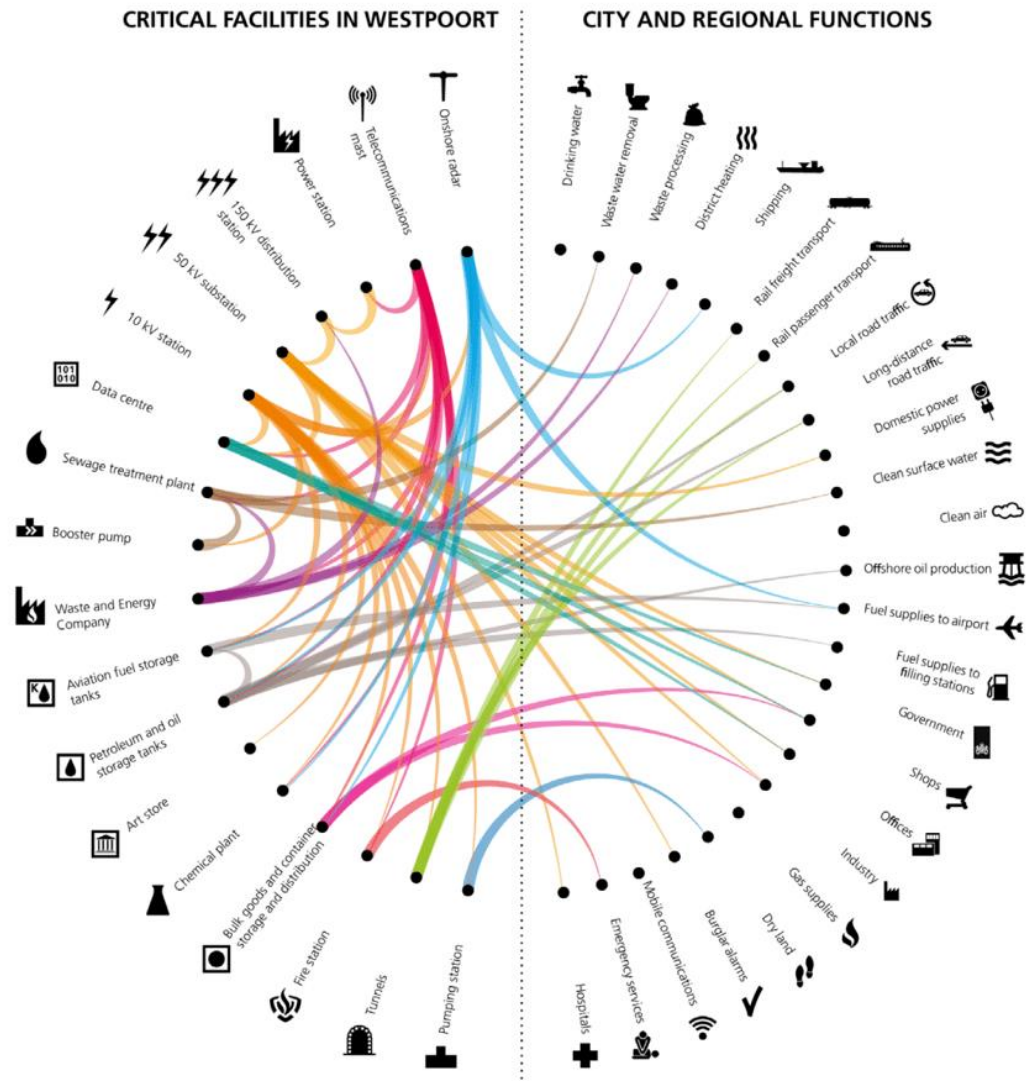
July 2020



THE DATA 'CHAIN OF CONNECTIVITY'



DIGITAL AS PART OF CNI



Committees

[UK Parliament](#) > [Business](#) > [Committees](#) > [National Security Strategy \(Joint Committee\)](#) > [News Article](#)

Call for Government to “get a grip” on climate change impacts

27 October 2022



A Committee of senior MPs and peers has implored the Government to get a proper grip on the major national security risks posed by the effects of climate change on critical national infrastructure (CNI), such as power, water, transport and communications.

1ST ORDER DIGITAL HEALTH EXAMPLE - HEATWAVE

London NHS trust cancels operations as IT system fails in heatwave

Guy's and St Thomas' trust having to postpone and divert appointments, with doctors unable to see patients' notes



Both of the trust's data centres, one at Guy's hospital and the other at St Thomas', stopped working on Tuesday afternoon. Photograph: Maureen McLean/Rex/Shutterstock

One of the NHS's biggest hospital trusts is facing major problems after its IT system failed because of the extreme temperatures earlier this week.

Lessons learnt report recommendations:

- Strategic plan for future events
- Set formal accountabilities and responsibilities
- Alert NHS England to wider sector risk
- Carry out emergency drills for future heatwaves
- Support staff suffering from stress from the event
- Clinical guidance for non-digital decision making
- Have effective paper based fallback processes
- Ensure data recovery is sound
- Full register of assets/software to help recovery
- No single points of failure in staff capabilities
- Plan for communications in major incidents
- Review cooling, air handling and flood prevention

2ND ORDER DIGITAL HEALTH EXAMPLE - PANDEMIC

WalesOnline 

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NHS Covid tracing app does not work on older phones

Health Secretary Matt Hancock told BBC Breakfast the “vast majority” of people had the right software, adding that some may need to upgrade their phone’s operating system

NEWS By [Neil Shaw](#) Network Content Editor (Live and Trends)

08:07, 24 SEP 2020 | **UPDATED** 09:08, 24 SEP 2020





PART 3 – CASCADE RISKS

How risks create chains of events....

'(Climate Driven) Digital Failure causes....?'

GOVERNMENT PREPARATION FOR ENERGY OUTAGES

Government tests energy blackout emergency plans as supply fears grow

Exclusive: Whitehall officials have 'war gamed' Programme Yarrow, a blueprint for coping with outages for up to a week



Concerns over the impact of an energy blackout have grown since the start of Russia's war on Ukraine. Photograph: Jon Bower/Alamy

The government has "war gamed" emergency plans to cope with energy blackouts lasting up to seven days in the event of a national power outage amid growing fears over security of supply this winter.

Figure 1 Highest priorities for further adaptation in the next two years



Source: CCC

Notes: Figure shows the changing magnitude over time of the risk areas that require the most urgent action in the next two years. Change in magnitude is shown up to 2100 for the highest scenario assessed in the Technical Report for the relevant risks for that theme. Details are set out in an accompanying Annex to this report.

CASE STUDY: STORMS

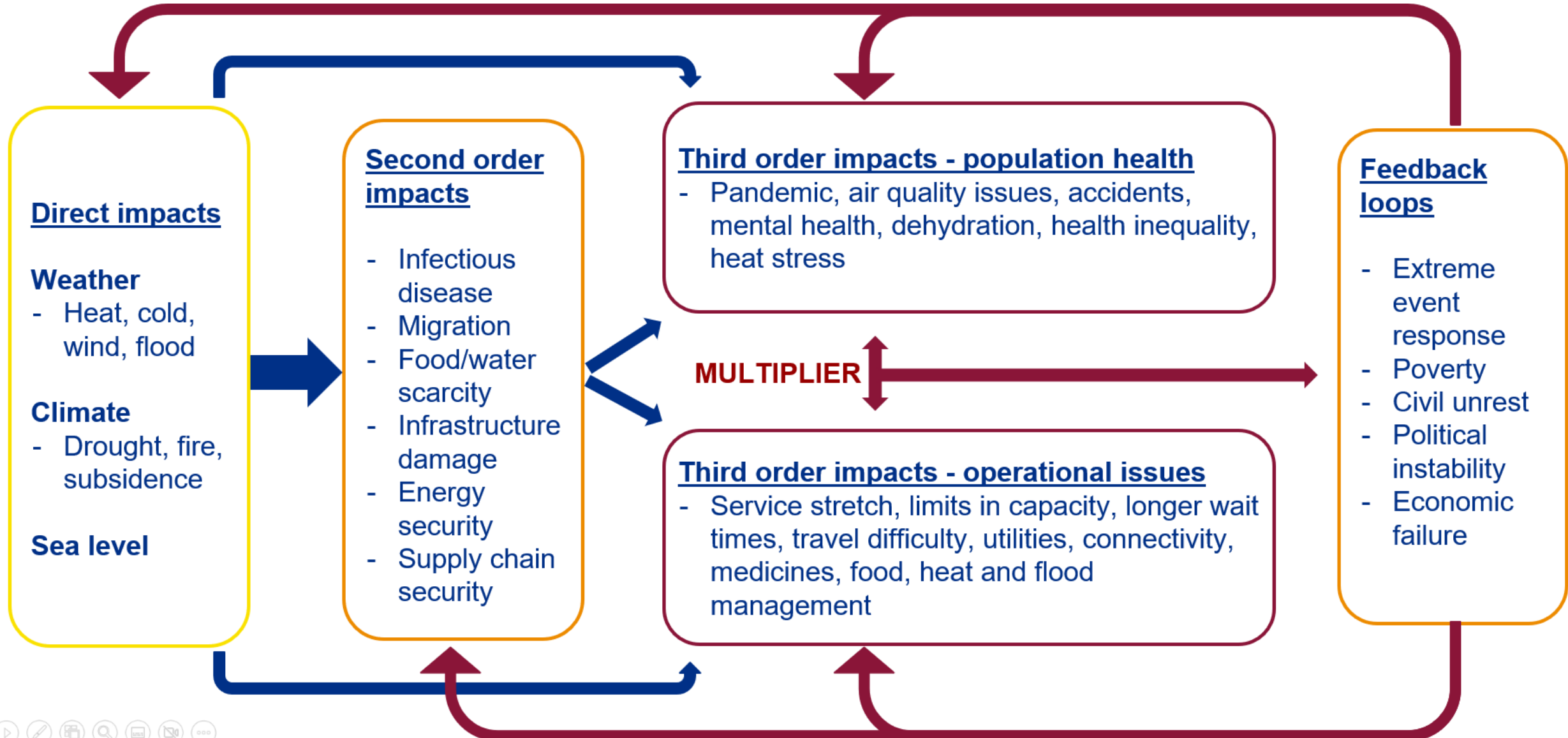
The screenshot shows the BBC News website interface. At the top, there are navigation links for Home, News, Sport, Weather, and iPlayer. Below this is a red banner with the word 'NEWS' in white. Underneath the banner are more navigation links: Home, Cost of Living, War in Ukraine, Coronavirus, Climate, UK, World, Business, and Politics. A secondary row of links includes England, Local News, Regions, and Lancashire. The main headline reads 'Substation flooding leaves 55,000 Lancaster homes without power' with a sub-headline 'without power'. The date '6 December 2015' is visible at the bottom left of the article preview.

Simple Cascade = Storm → Energy Outage →
Digital Failure → Societal Bad Stuff...

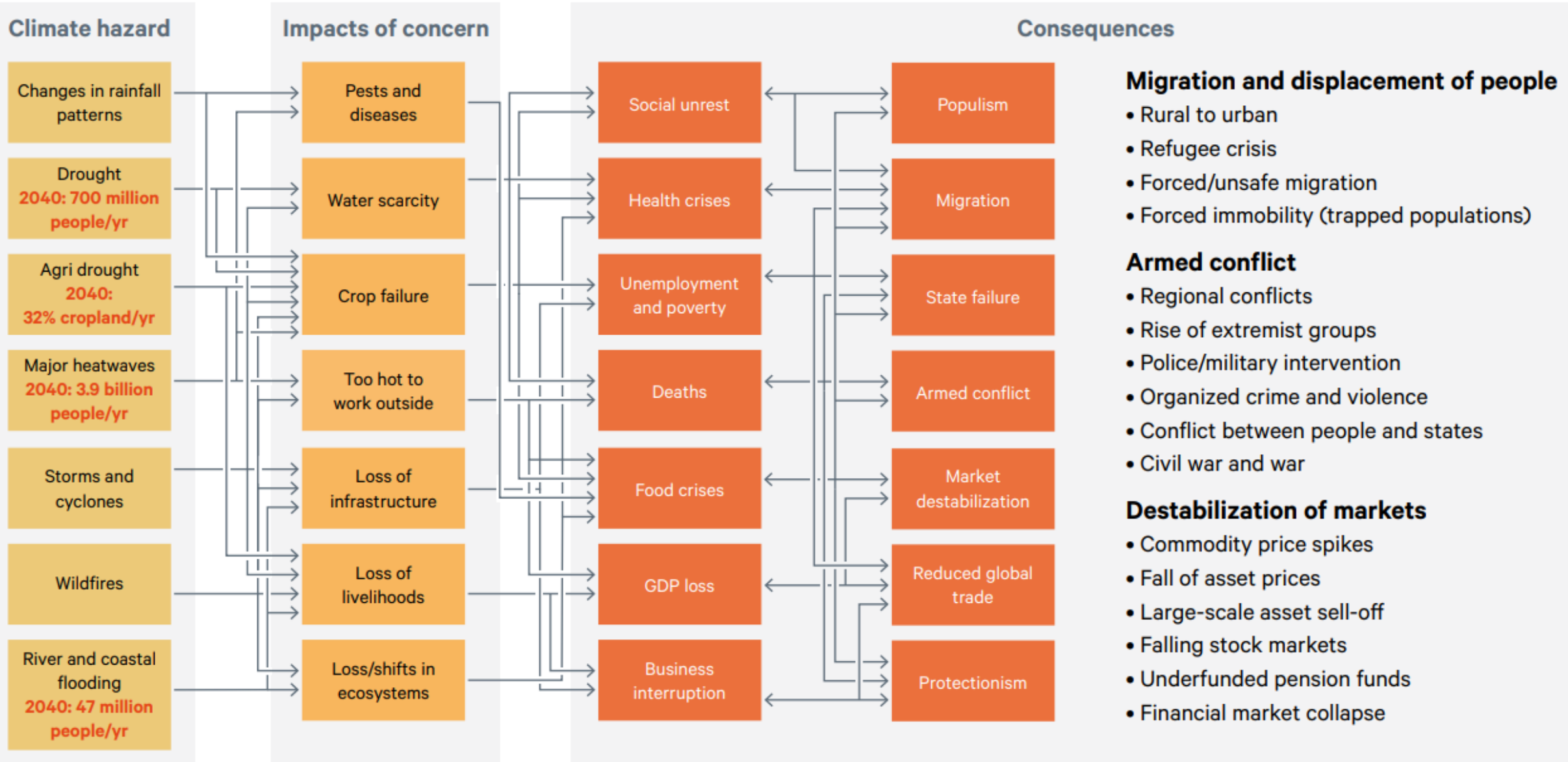
TIMELINE OF A BLACKOUT

0 hours	Services with backup generators and uninterruptible power supplies will continue Closure of all other services (e.g. financial and educational)
0-2 hours	Increased demand on public services (e.g. health and social care) Closure of transport networks.
2-6 hours	After two hours the mobile phone network is likely to go down Public unable to communicate; limited radio broadcasts maintained via BBC Radio 1-4 (but how many have battery-powered radio or would think of using a car radio?)
6-12 hours	Severe staff absence begins due to transport disruption and school closures
12-48 hours	Water supply failure (some water treatment works can only last for six hours without electricity) Food in fridges and freezers will start to go off
2-7 days	After five days, the core fixed telecoms network is likely to fail Airwave network (mobile comms network used by emergency services) batteries will need to be charged Potential public disorder

CASCADE RISKS IN HEALTH



CHATHAM HOUSE CLIMATE RISK ASSESSMENT 2021



INTERPLAY BETWEEN CLIMATE AND OTHER RISKS

THE WALL STREET JOURNAL.

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BUSINESS

Ship Stuck in Suez Canal and Chip Shortages: What Global Supply-Chain Problems Mean for You

The blocked Suez, semiconductor shortages and surprisingly cold weather have disrupted how manufacturers world-wide ship and receive goods



PART 4 – MY DIGITAL CLIMATE RISK
PROTOTYPE TOOL

WHAT IS IT? (AND WHAT ISN'T IT!?)

Developed in Summer 2022 with an MSc from University of Leeds sustainability consultancy course

It is a conversation starting tool that aims to get digital health programmes understanding the key considerations for thinking about climate risk in their services and how to start measuring and managing it.

It isn't a fully blown tool allowing compliance with climate risk management obligations – that would be too difficult currently in terms of burden, skills and resourcing. It would not be seen as proportionate.

PROTOTYPE DEMONSTRATION

The screenshot displays the Microsoft Excel interface with the following content:

- File Name:** Digital Health Climate Change Resilient Design Checklist V0.1 • Saved
- Home Tab:** Clipboard, Font (Calibri, 12), Paragraph (B, I, U, A), Alignment (Merge & Centre), Number, Styles (Conditional Formatting, Format as Table, Cell Styles), Cells (Insert, Delete, Format), Editing (Sort & Filter, Find & Select), Analysis (Analyse Data), Sensitivity.
- Worksheet:** A2
- Row 2:** **Notes** | Version 0.1 | Jul-22 | Author - Ben Plunkett (MSc Student) - gy18b2p@leeds.ac.uk
- Row 4:** 1. This tool is created for analysis of climate change resilient digital service design
- Row 6:** 2. The tool tackles three main categories - programme risk management strategy, a vulnerability assessment, and a checklist of potential risk mitigation strategies
- Row 8:** 3. Complete all three tabs to achieve an estimation as to the maturity of programme climate change resilience
- Row 10:** This form will help your programme comply with government-led guidance and obligations linked below:
- Row 11:** **Tech Code of Practice** (<https://www.gov.uk/guidance/the-technology-code-of-practice>)
- Row 12:** **HMG's Greenbook guidance in adaptation to climate change** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/934339/Accounting_for_the_Effects_Of_Climate_Change_-_Supplementary_Green_Book)
- Row 13:** **Greening government commitment** (<https://www.gov.uk/government/publications/greening-government-ict-and-digital-services-strategy-2020-2025/greening-government-ict-and-digital-services-strategy-2020-2025>)
- Row 14:** **Greener NHS Plan** (<https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf>)
- Row 17:** **User/ Programme information**
- Row 18:** User name:
- Row 19:** Programme:
- Row 20:** Date:
- Row 24:** **RESULTS**
- Row 25:** **Maturity of climate change resilience in digital service design**
- Row 26:** Score
- Row 27:** Programme vulnerability score
- Row 28:** Climate change risk mitigation maturity
- Row 29:** Triage Routes | Carry on (low risk identified) / Monitor (medium risk) / Active Mitigation Needed (High Risk)

DEVELOPMENT OF A SCORING TRIAGE SYSTEM

We aim to embed a quantitative element into the tooling – forming a score as to a digital health programme’s maturity in climate change resilience. This scoring will create a triage output to either recommend;

1. Continuing current processes (best scenario),
2. Monitoring (areas for improvement),
3. Adaptation needed (serious vulnerabilities identified)

Proposed formula –

Each question will produce a 1 or a 0 output – based upon whether the answer is positive or negative.

General formula: Climate change resilience maturity = risk assessment practices + mitigation measures – vulnerability assessment

Risk assessment tab will produce a score out of 15 – used as a percentage e.g. 12/15 would be 80% or 0.8

Vulnerability assessment will produce a score out of 27 – 1 for low, 2 for medium, 3 for high. Scoring will be used as a decimal again.

Mitigation checklist will produce a score out of 20 – 1 for a positive answer, 0 for negative answer. Again used as a percentage

Max score = 2

Triage output: Minus result: Adaptation needed/0-1: Monitoring /1-2: Continue current processes

FEEDBACK AND DISCUSSION

Topic	Feedback	Next steps?
Tooling application within business practices	Some confusion as to how this would fit within current practices – who would conduct it? In what stage of development? How often?	Participants suggested that this would most likely fit within current risk assessment practices – to become a part of best practice – conducted in unison with ongoing business continuity plans and risk assessments
Scoring	The clarity in the calculations involved in the scoring system was questioned – how is the maturity score developed? What will the user do with the score that is produced?	A quantitative metric is one of the key next steps in this checklist – very difficult given the complex nature of calculating resilience (how do you weight each section) – but an example of how this might be done is provided in the 'next steps' section
Language	Some of the language chosen in the questions was also questioned – argued as too wordy/ broad	Questions that participants described as confusing are highlighted in the spreadsheet – rewording of these questions is needed
Instructions need to be clearer	Not a clear link between how the different tabs all fit together	Will become a lot clearer for the user once the scoring metric is finalised – will understand how each tab contributes to the overall maturity score
Format of the checklist questioned	Excel spreadsheet may not be the most efficient method of organising this spreadsheet – some people favoured for it to be uploaded to a website so it is easily accessible	Once the content of the checklist is finalised there may be a benefit in uploading it online to be more easily accessible for potential users
Vulnerability tab	Participants questioned whether it was too broad a scope, and whether this made it superficial	Aim of the tab is to provide a general outlook on the most material hazards therefore it was decided that this feedback should not be acted upon. If the tab was to become more specific (i.e. focusing on more specific hazards such as fluvial vs pluvial flooding) it would only increase the complexity and make it difficult for the user to fill out

The background of the slide is an abstract, textured composition of teal and red colors. The teal is a vibrant, slightly desaturated blue-green, while the red is a deep, almost blackish-red. The colors are blended together in a way that creates a sense of movement and depth, with some areas appearing more saturated than others. The overall effect is dynamic and visually striking.

PART 5 – GETTING EXEC LEVEL BUY-IN ON CLIMATE RISK

Concise, effective (and emotive?)
communication to enhance prioritisation

WEAKNESSES OF THE BUSINESS CONTINUITY FRAME



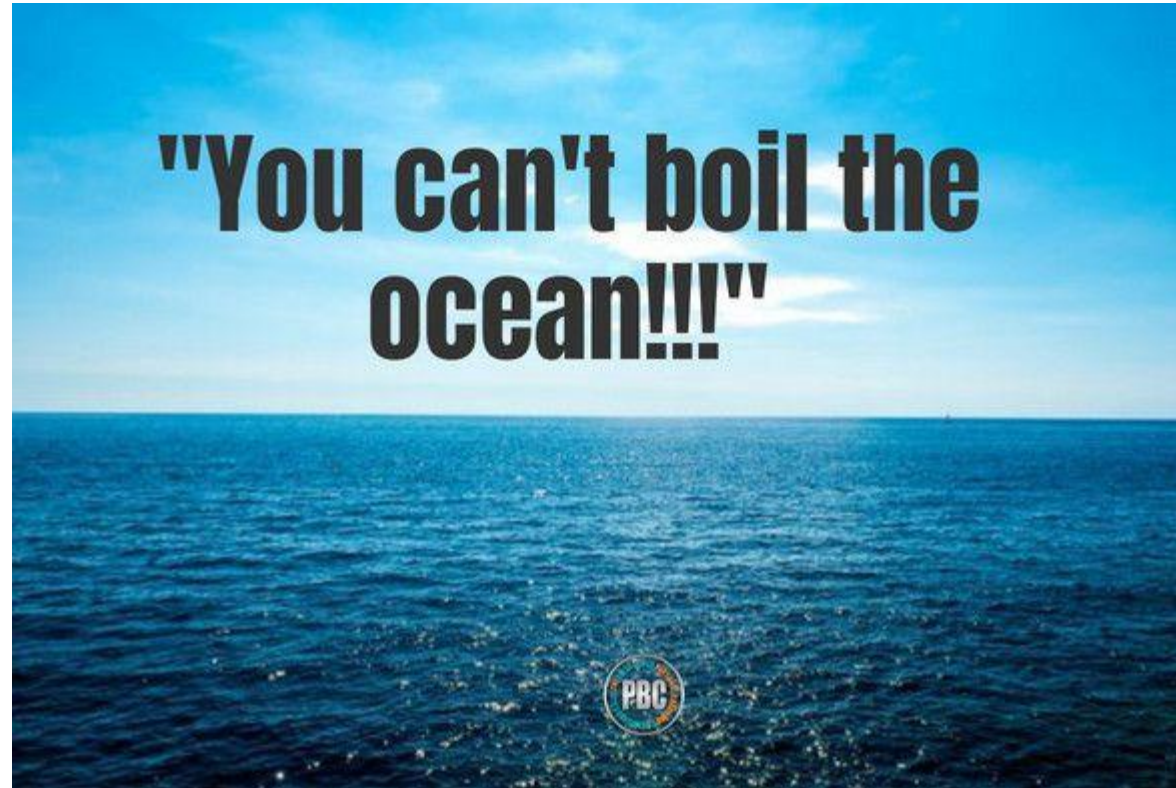
Reactive – trigger agnostic – cures disruption



Proactive – trigger specific – prevents disruption



WHAT'S MY PROBLEM TO SOLVE!?



But can I be sure other people are solving their parts of the problem!?

MAKING THE CASE FOR CONSIDERATION

Core Elements of Recommended Climate-Related Financial Disclosures



Governance

The organization's governance around climate-related risks and opportunities

Strategy

The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management

The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets

The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Understanding the risks to complex digitised infrastructure e.g. Electronic Patient Record systems

Size of the prize!



PIGGY-BACKING ON 'MORE IMPORTANT' RISKS

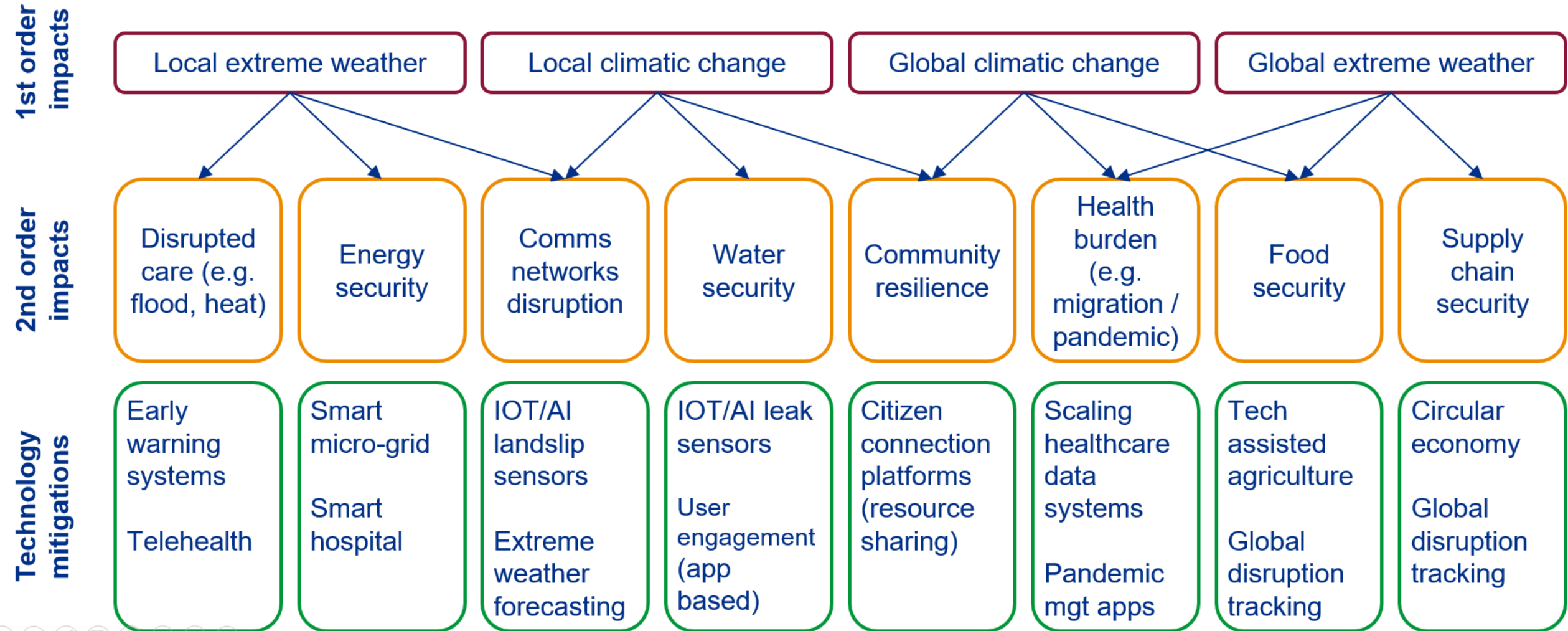
WHAT IS **CYBER** RISK MANAGEMENT?



- 1. Risk assessment**
- 2. Physician and staff training**
- 3. Resources**
- 4. IT services**
- 5. Cyber liability insurance**

FINDING A GOOD NEWS STORY

This diagram provides a broader view of how technology can be used to respond to or mitigate the impacts of climate change



An abstract, painterly background featuring swirling, organic shapes in shades of teal, cyan, and red. The colors are layered and blended, creating a sense of depth and movement. The overall effect is reminiscent of a marbled paper or a liquid-based artistic technique. The text 'THE END!' is overlaid on the left side in a white, sans-serif font within a black rectangular box.

THE END!