Climate Impact Assessment Training Series

Webinar 2: Evaluating and managing climate risks to HEIs

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Recap of Webinar 1

- Defined **key concepts** around resilient net zero (RNZ)
- Step1: Discussed **adaptation objectives** for HEIs that align with national and sector plans for climate action
- Step 2: Reviewed essential **contextual information** to establish baseline knowledge and activities for RNZ plan

Stakeholders

Teaching & Research Staff

Media & Public Relations

University Senate

Sustainability Team

Undergraduate & Postgraduates

Senior Management

Finance & Procurement

Student Hall Representatives

Student Union

Estates Management

Regional Agencies

Local Communities

Local Authorities

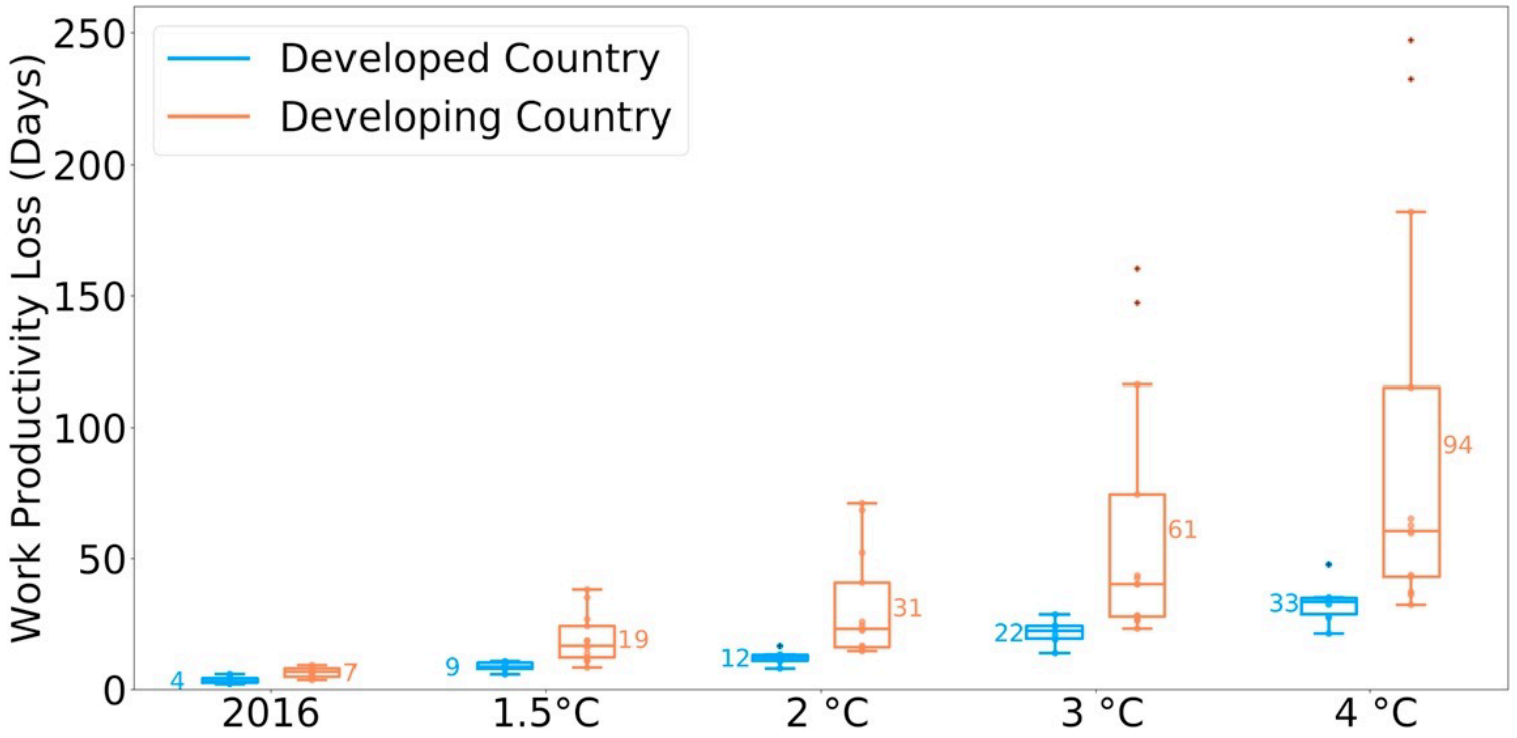
Useful information

Source: Met Office

- High-resolution campus/site elevation data
- Detailed maps of land use, buildings, and critical infrastructure
- Inventories of building type, fabric, and performance
- Local weather, river flow, and biodiversity records
- Evidence of any historic impacts (such as floods and heatwaves) on people, facilities, and operations
- Model projections of future climate conditions, such as rainfall and temperature extremes
- Strategic development plans for student numbers, research, teaching and supporting estates

Global impacts (loss of productivity)

$$\mathrm{WPL} = \mathrm{Days}_{\mathrm{absenteeism}} + \mathrm{Days}_{\mathrm{presenteeism}} \times \mathrm{Loss}_{\mathrm{efficiency}}$$



UK questionnaire results (*n*=104) give WPL on hot-days: **2.8 (2016)**
Climate change scenarios, WPL: 7-8 (+1.5°C); 10-12 (+2°C); 18-19 (+3°C)

Source: Shuang et al (2019)

CCRA 3 B5 (loss of productivity)

B5. Reduced employee productivity in businesses

Business and Industry				
Risk or Opportunity	**Receptor**	**Nature of risk/opportunity**	**England Urgency Score**	**Risk Owner**
RISK	B5. Reduced employee productivity in businesses	Infrastructure disruption and higher temperatures in working environments	Further investigation	BEIS

Summary of risk definition and description

A changing climate has the potential to affect productivity, potentially both negatively and positively, as well as indirectly through infrastructure disruption and higher temperatures in working environments. However, there is limited evidence on future risks to productivity. In this risk, employee productivity relates to work output, as opposed to labour productivity which refers more to workplace efficiency, output per worker, per job and per hour. Current magnitude is low but may become medium to high by the end of the century.

There are also risks associated with extreme high temperatures, which can have negative impacts on employees' health and wellbeing and ability to commute to work. There is some evidence that businesses in England are experiencing these impacts already. The risks are likely to vary widely across business sectors or geographies, with factors such as the type of work, for example construction or industrial processes, whether it takes place indoors or outdoors and the local built environment and infrastructure factors, for example passive ventilation, all playing a role. The COVID-19 related shift to homeworking also creates a new risk, particularly for those employees working from homes prone to overheating.

Workers engaged in certain occupations, for example heavy outdoor manual labour, are likely to be at the greatest risk of heat stress. Recent evidence from the social care sector points to detrimental impact of heat on staff wellbeing. A case study of an older and a modern care home in London reported that staff found the summertime thermal conditions more uncomfortable than the residents did.

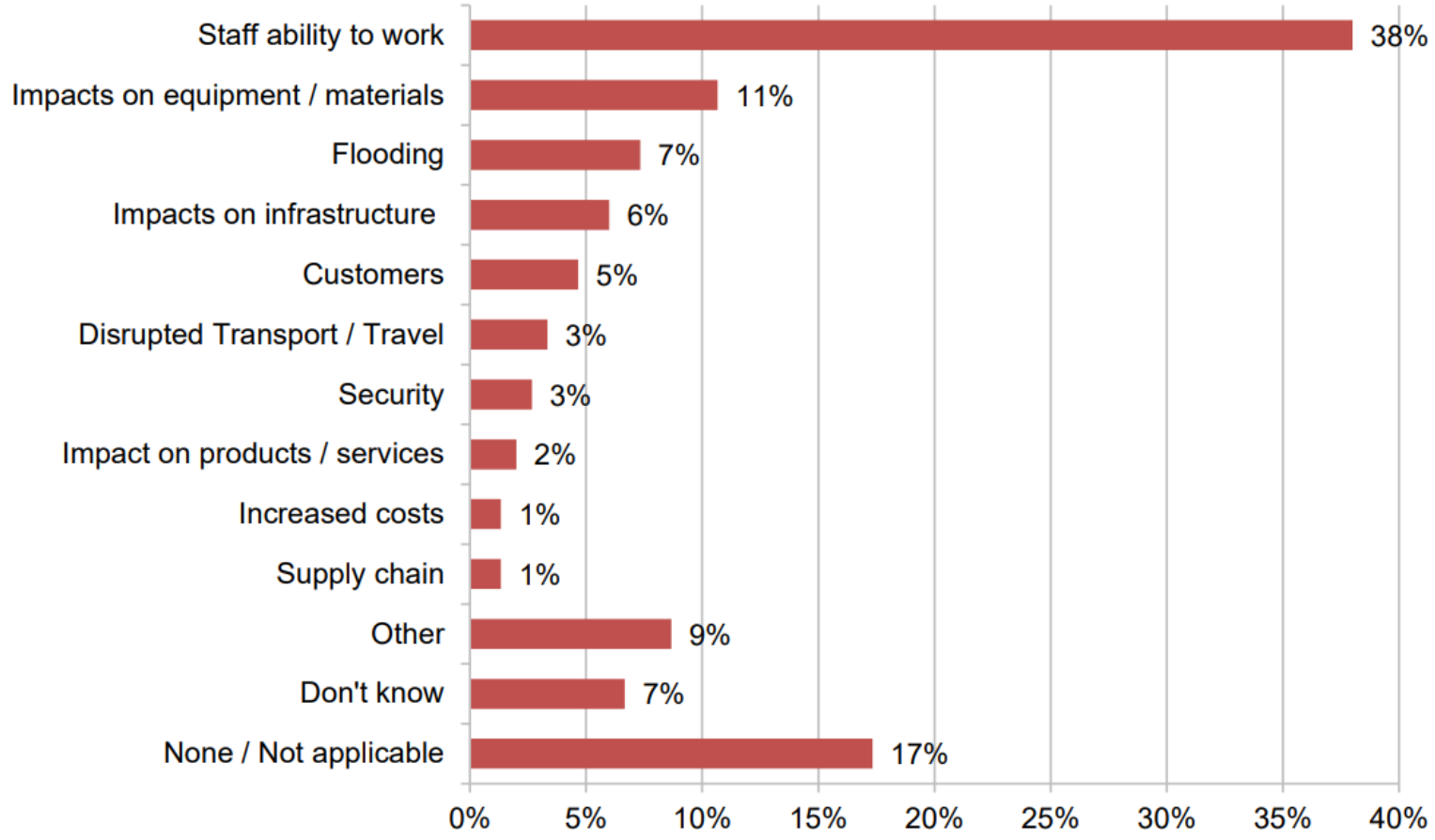
However, only a limited number of studies have considered the impacts of higher temperatures on productivity in the UK and there is therefore considerable uncertainty about the magnitude of impacts and the degree of the risk to the UK both now and in the future and differentiating this between nations. One study estimates a 2% reduction in labour productivity by the end of a century.

Business decisions today about design and operation of office buildings and sites, and manufacturing processes with have high capital expenditure will determine future risk levels and are important given the lifetime of these investments. Similarly, the literature has clear thresholds associated with certain types of work, levels of work output (for different types of indoor and outdoor work) and wet bulb temperature, a combined measure of heat and humidity exposure. There are also potentially synergies and trade-offs with Net Zero, particularly through air conditioning as adaptation increases energy use, and the use of refrigerants with high global warming potential which could leak. There is also the potential for feedback loops to be created in urban areas, with heat islands being worsened by the excess heat from air conditioning units.

See: CCRA3 Chapter 6

Wales (loss of productivity)

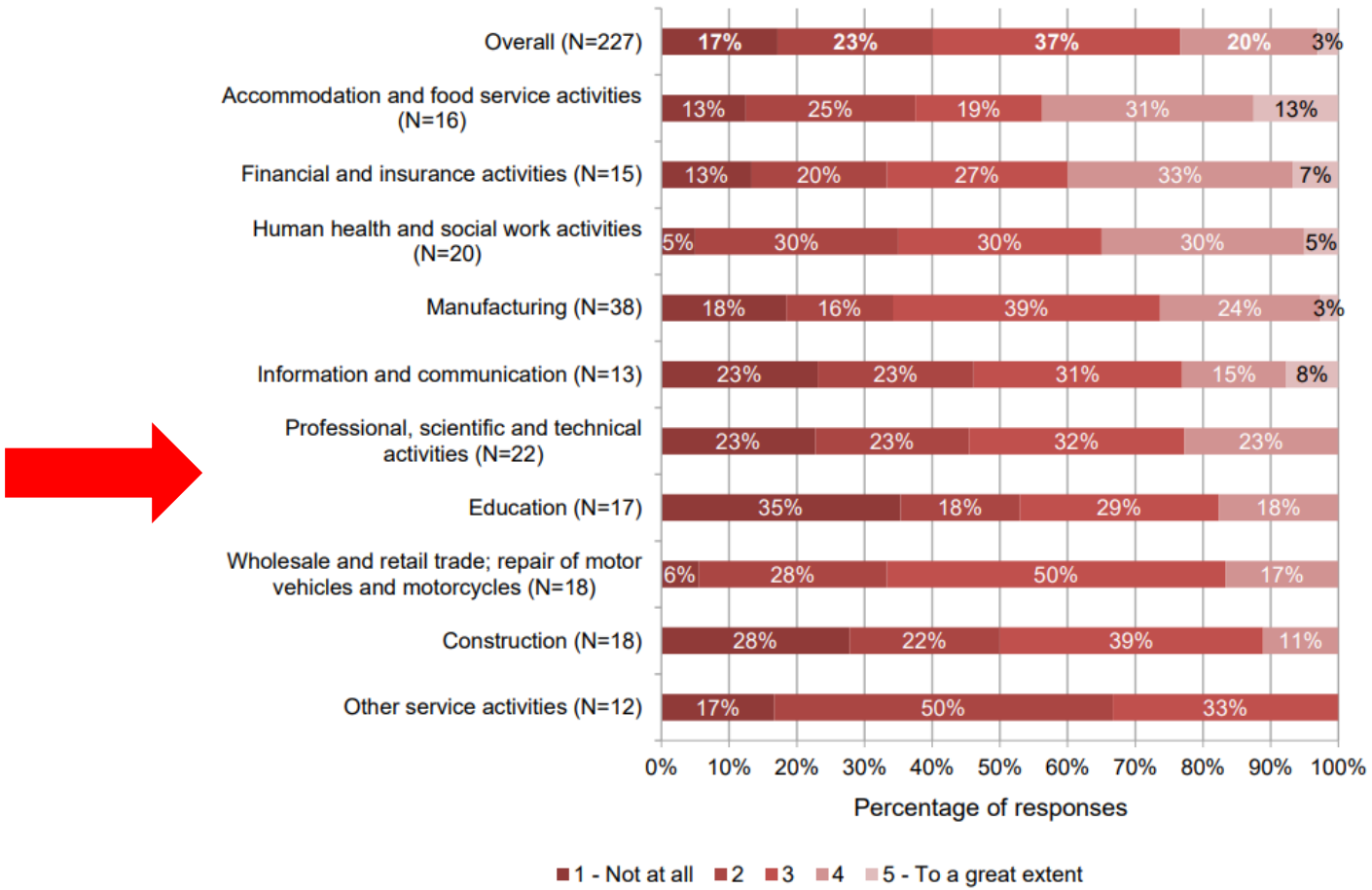
Figure 3.3: Please explain what risks you perceive there to be to productivity due to increased working temperatures (code)



Source: Welsh Government (2020)

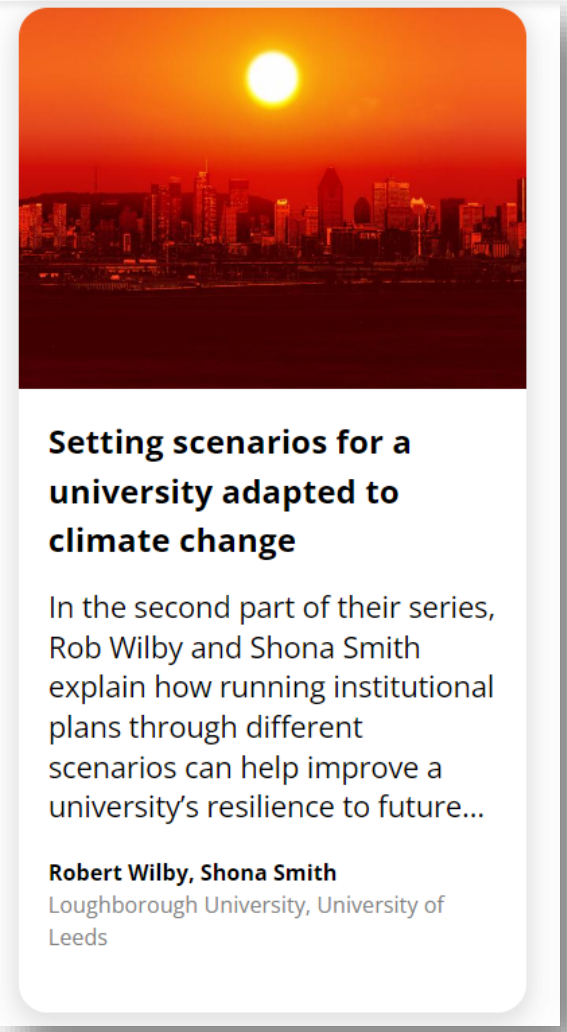
Wales (loss of productivity)

Figure 3.5: To what extent do you believe your business is at risk from the effects of climate change? (where 1 = 'not at all' and 5 = 'to a great extent')



Source: Welsh Government (2020)

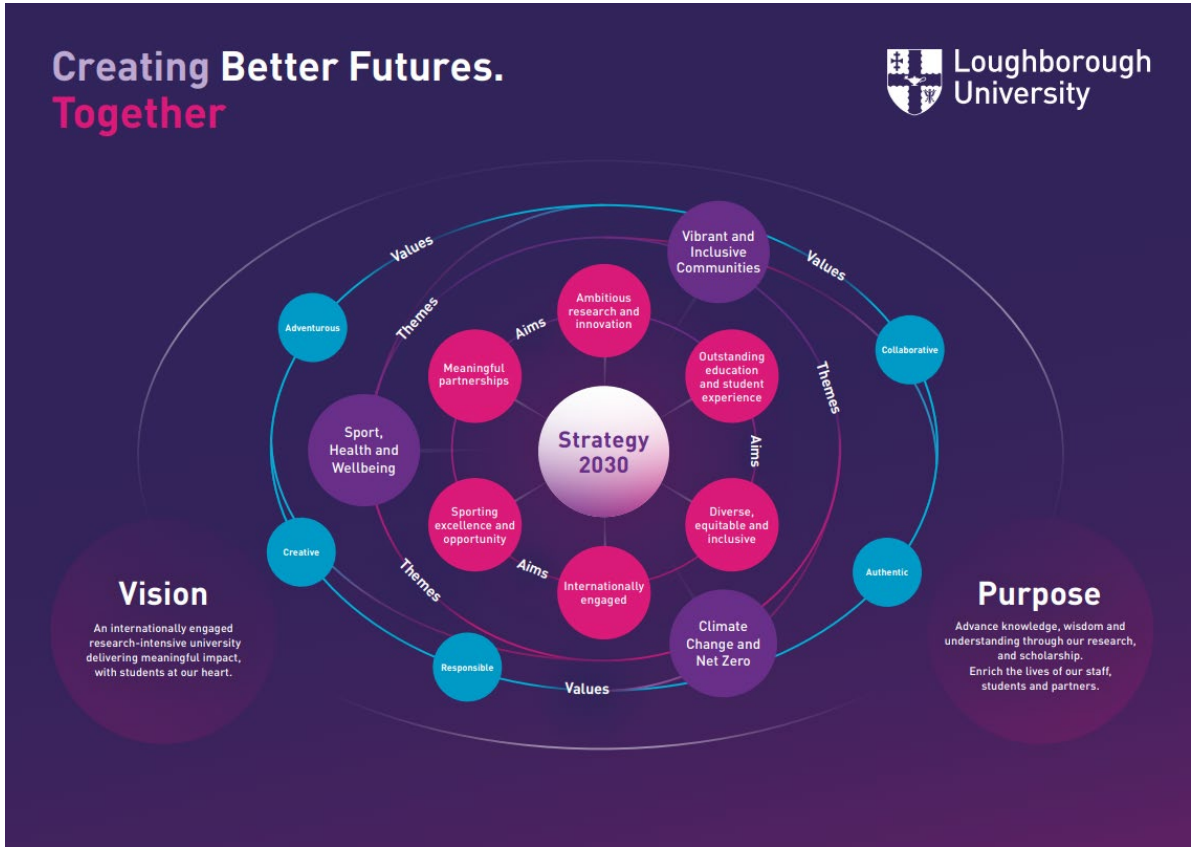
Discussion of tasks set in Webinar 1



1) Read THE Campus article on *Setting scenarios for a university adapted to climate change*
2) Identify some key strategies and/or policies for your HEI where there may be entry points for climate action
3) Write a 2-3 sentence statement of intent for RNZ at your HEI; this can be as high-level or specific as you like
4) Identify 3 academics or groups at your HEI who might be able to contribute useful data, knowledge, or skills on RNZ

Strategies, vision, and experts

Strategic themes: (1) Sport, health and well-being; (2) **Climate change and net zero**; (3) Vibrant and inclusive communities



*We will establish a compelling **international profile** and reputation, built on our distinctive strengths. In key world regions, we will be valued for the relevance and impact of our research and for our important contribution as a responsible **international partner**.*

Source: Loughborough University

Strategies, vision, and experts (2)

We will grow our research and innovation capacity, in areas such as clean energy and the circular economy, to enable the university to play a leading international role in responding to the climate emergency

We will develop students who have a high degree of climate change awareness and carbon literacy so that they can take responsibility for sustainable actions in themselves and others

We will help diverse communities around the globe adapt and prosper in a changing world climate

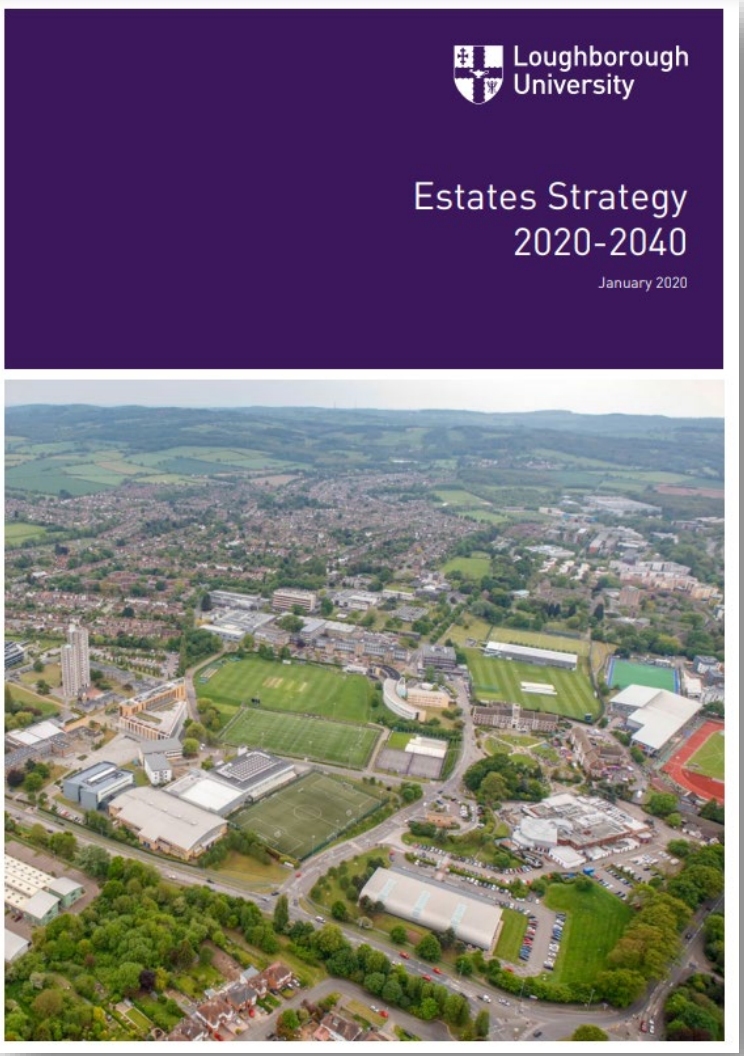
We will bring together our creative, analytical and technological expertise to accelerate a reduction of global emissions

We will use our expertise and influence to help sporting policy makers and organisations in their transition to net zero

We will seek and engage strategic partnerships that will strengthen our response to the climate emergency and help accelerate progress towards net zero

Source: Loughborough University

Strategies, vision, and experts (3)



Source: Loughborough University

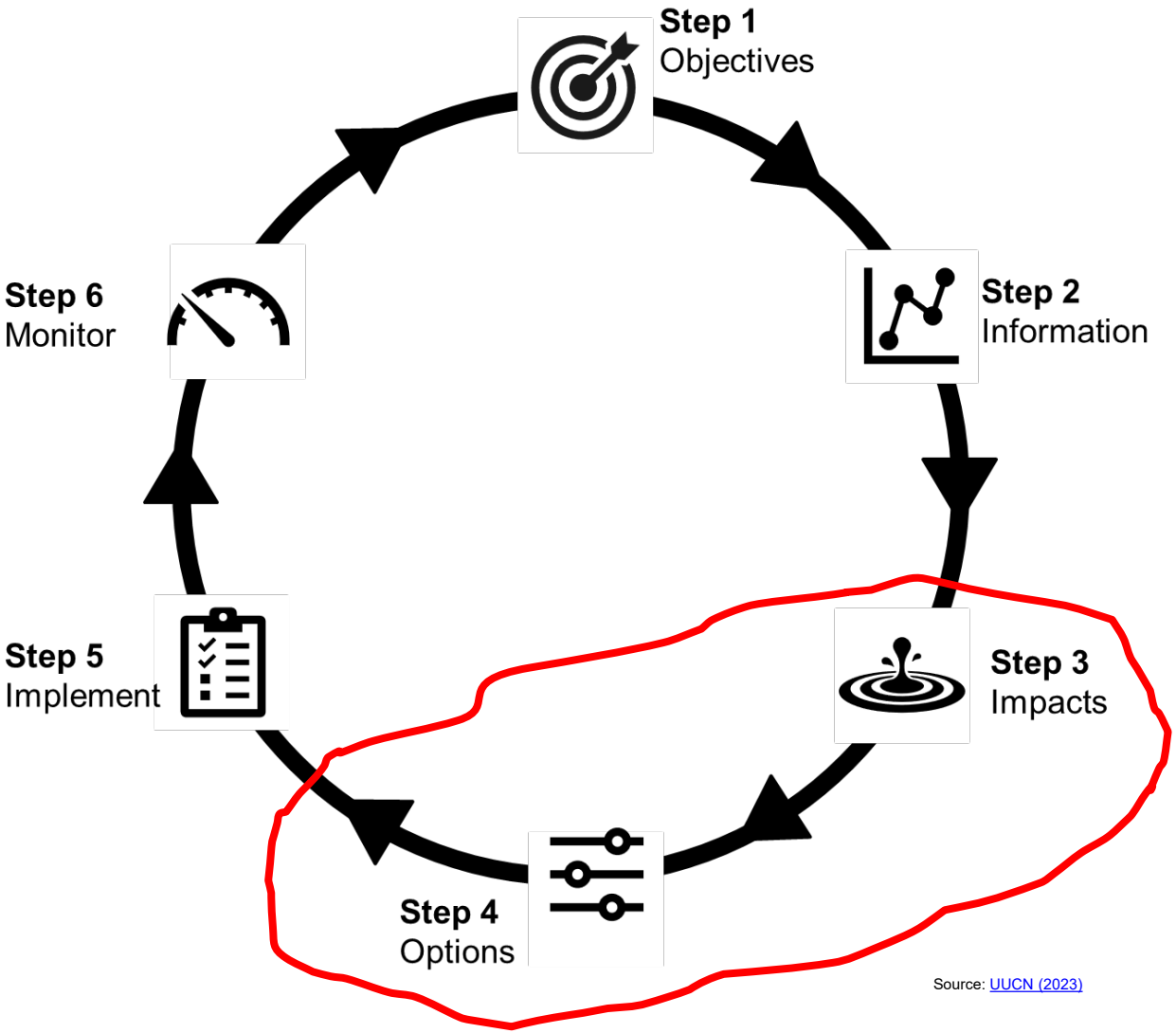
We will engage staff, develop our estate, and change working practices to achieve net zero emissions from our own operations

*…All future approvals should seek climate modelling **and risk assessments** and net zero carbon projects/proposals as these will all have a critical impact on the University's ability to meet the 2050 net zero carbon target…*

Sustainability Strategy (due January 2024)

Experts: Passive cooling of buildings; flood simulation and forecasting; biodiversity and habitat restoration; physical climate risks

Focus of Webinar 2



Source: UUCN (2023)

Part I: Assessing climate risks (Step 3)

Perceptions of risk vary

Source: The Guardian

Risk = Likelihood x Consequence(s)

		Consequence level				
		1	2	3	4	5
Likelihood level	Descriptor	Insignificant	Minor	Moderate	Major	Catastrophic
5	Almost certain	5	10	15	20	25
4	Likely	4	8	12	16	20
3	Possible	3	6	9	12	15
2	Unlikely	2	4	6	8	10
1	Rare	1	2	3	4	5

Risk rating
Extreme
High
Moderate
Low

Risk assessment is:

- ***Proactive*** rather than reactive to future threats and opportunities presented by climate change;
- ***Versatile*** for a range of impact receptors such as people, assets, places, species, or business operations;
- ***Rational*** way of targeting resources and planning.

Biodiversity

Soils

Carbon stores

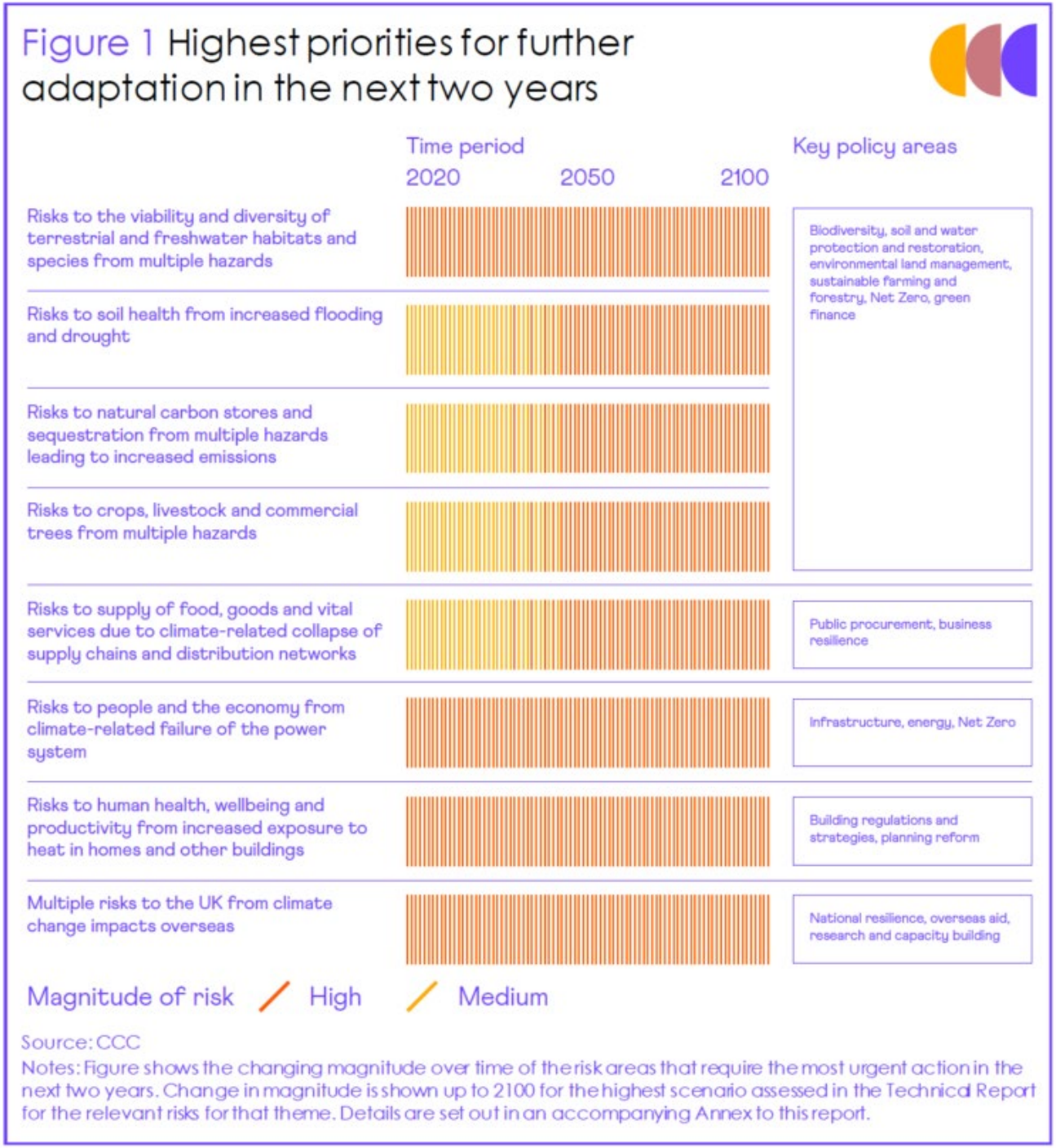
Agriculture

Food security

Power supplies

Heat

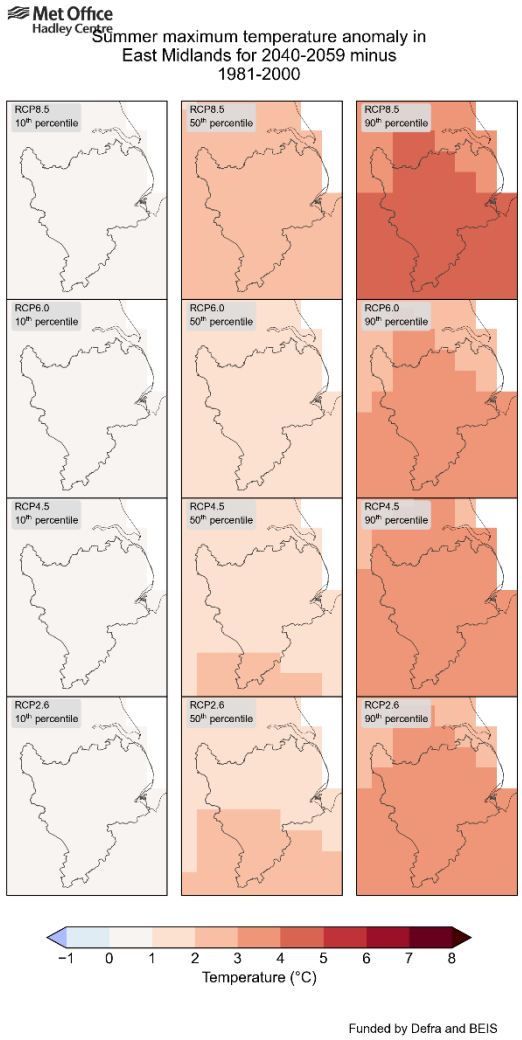
International

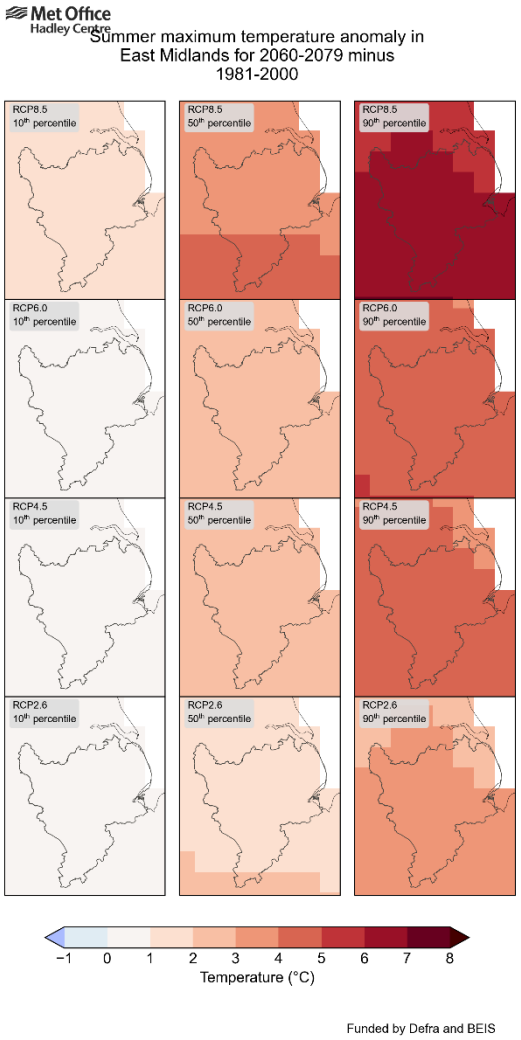


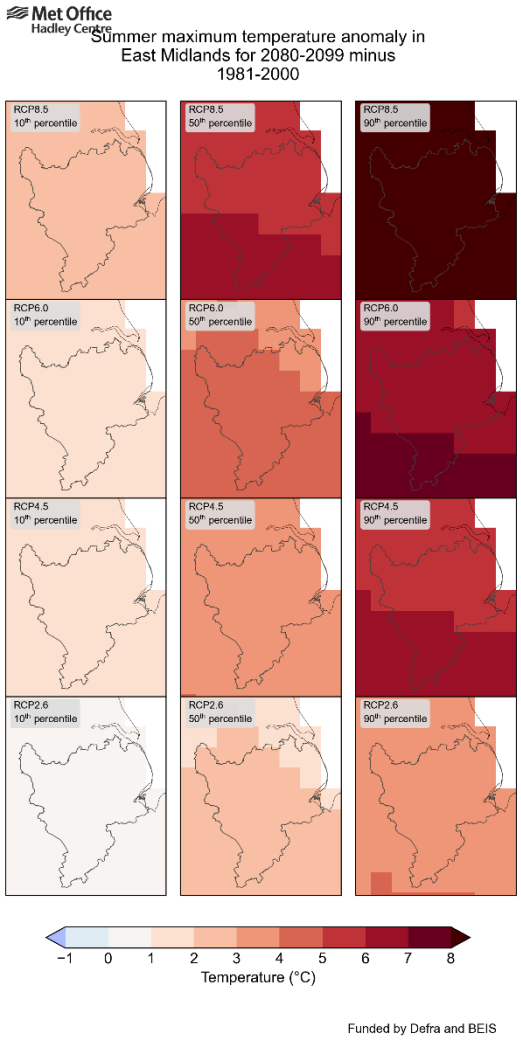
Source: [Climate Change Committee]

Climate risks to UK HEIs (now)

Climate risks to UK HEIs (future)







Source: UKCP18 Climate change projections over land

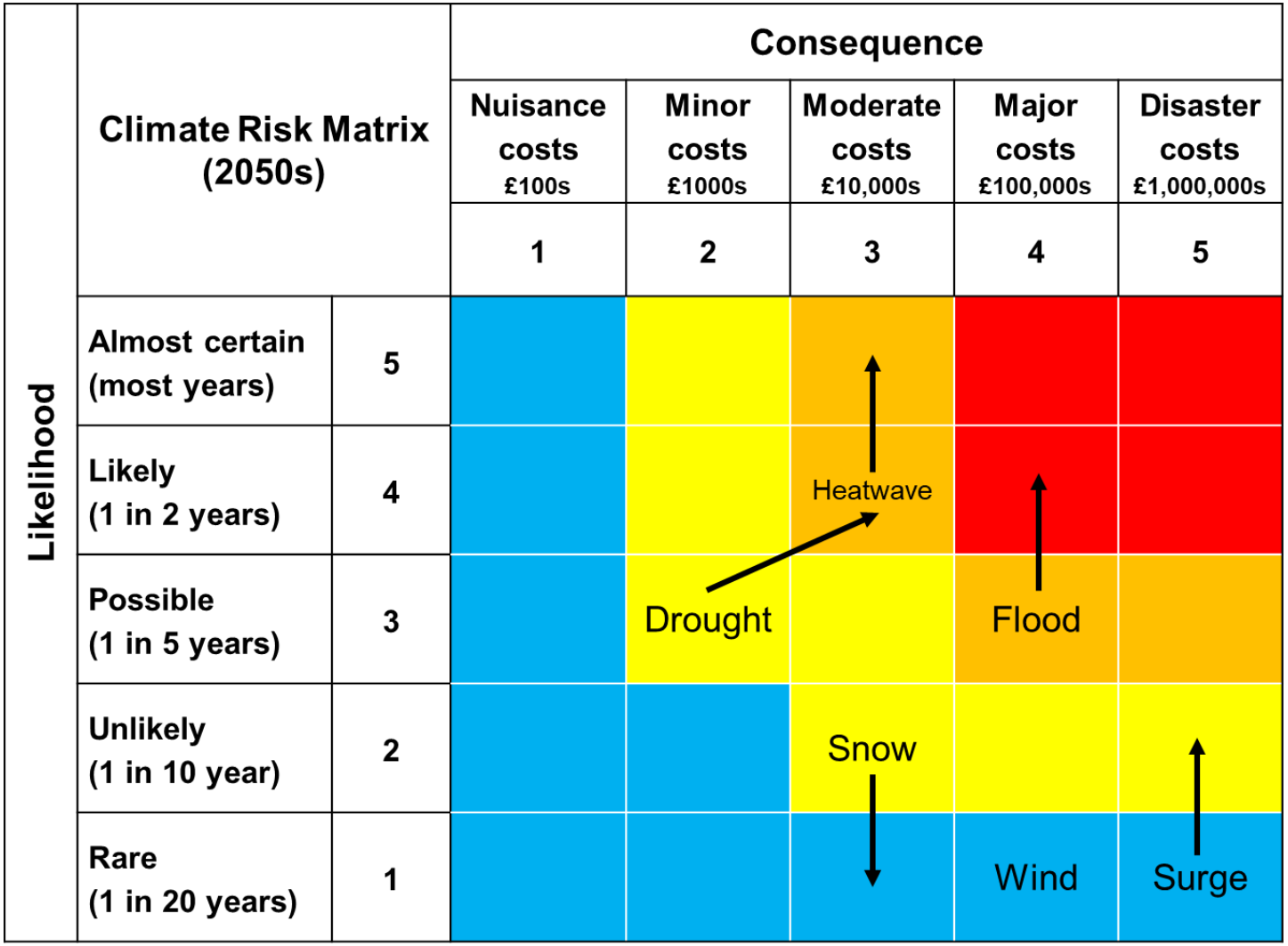
Likelihood and consequence (units)

Likelihood	Climate Risk Matrix (Damages £)		Consequence				
			Nuisance costs £100s	Minor costs £1000s	Moderate costs £10,000s	Major costs £100,000s	Disaster costs £1,000,000s
			1	2	3	4	5
	Almost certain (most years)	5					
	Likely (1 in 2 years)	4					
	Possible (1 in 5 years)	3					
	Unlikely (1 in 10 year)	2					
	Rare (1 in 20 years)	1					

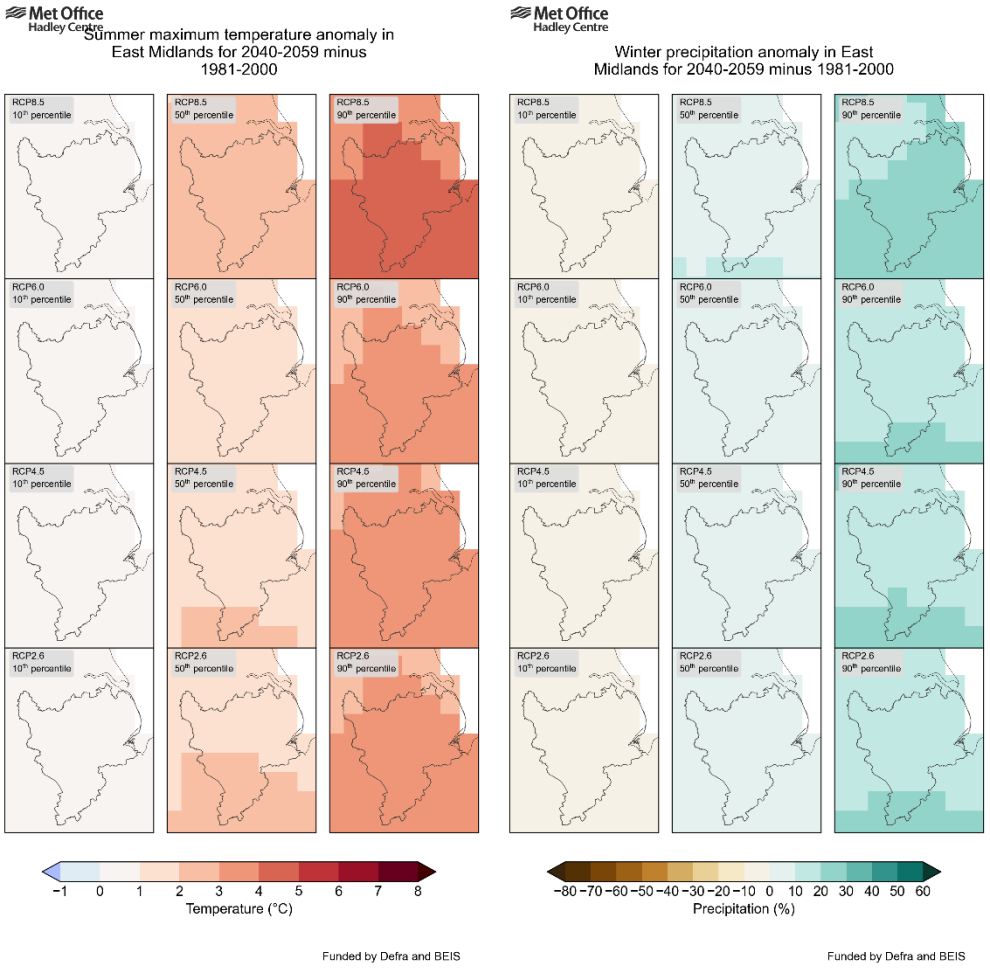
Baseline risks (campus level)

Likelihood	Climate Risk Matrix (Baseline 2020s)		Consequence				
			Nuisance costs £100s	Minor costs £1000s	Moderate costs £10,000s	Major costs £100,000s	Disaster costs £1,000,000s
			1	2	3	4	5
	Almost certain (most years)	5					
	Likely (1 in 2 years)	4			Heatwave		
	Possible (1 in 5 years)	3		Drought		Flood	
	Unlikely (1 in 10 year)	2			Snow		
	Rare (1 in 20 years)	1				Wind	Surge

2050s risks (campus level)



Pause for reflection



Source: UKCP18 Climate change projections over land

What is the attitude to climate-related risks at my HEI?

What extreme weather impacts have already impacted my HEI?

How frequently have these impacts occurred historically?

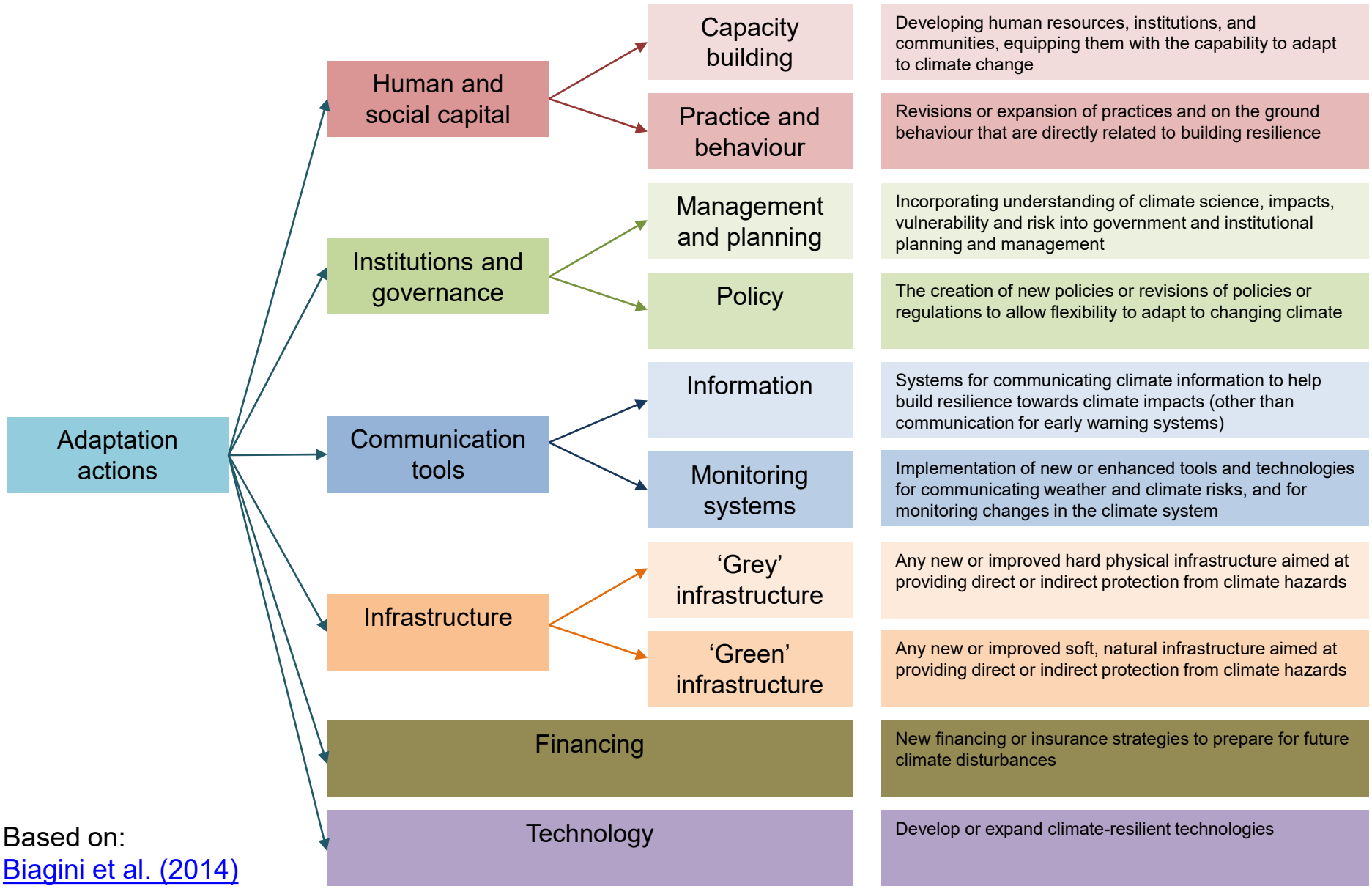
What were the associated costs, damages and levels of disruption associated with each hazard?

How might the likelihood and consequence of these hazards change in the future?

What is most at risk at my HEI?

Part II: Identifying adaptation options (Step 4)

Adaptation checklist (GEF projects)



Based on:
Biagini et al. (2014)

Adaptations for HEIs (ChatGPT)

1. Embed climate change and adaptation topics into the curriculum across various disciplines.

2. Establish research centres focused on climate science, adaptation strategies, and sustainable technologies.

3. Develop and implement climate resilience plans for campus infrastructure, including buildings, utilities, and transportation.

4. Implement water-saving measures, such as rainwater harvesting and drought-tolerant landscaping.

5. Design campus landscapes and green spaces to enhance resilience to climate-related events.

6. Offer workshops and training programs on climate adaptation for students and staff.

7. Invest in advanced technologies for monitoring and responding to climate-related risks on campus.

8. Develop and regularly test emergency response plans for extreme weather events and other climate hazards.

9. Engage with local communities to collaborate on climate adaptation initiatives and share knowledge.

10. Implement green procurement policies that prioritize sustainable and climate-resilient products.

11. Encourage and support student-led climate adaptation and sustainability projects.

12. Incorporate climate adaptation into long-term campus planning and development.

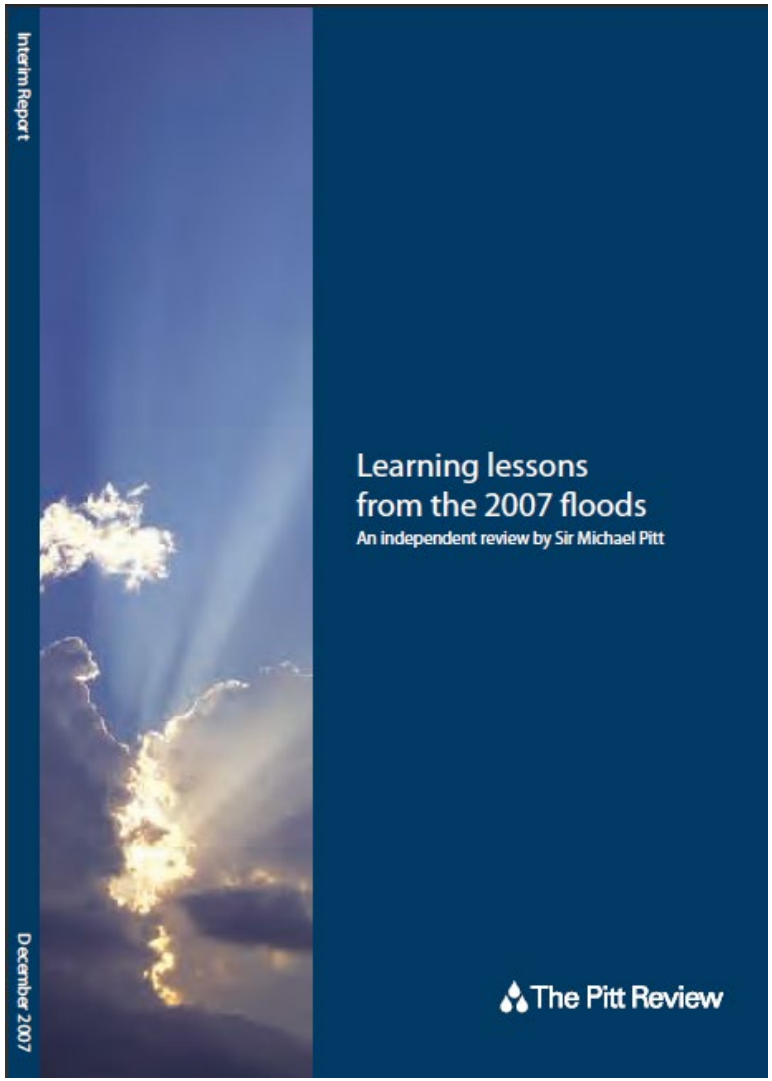
13. Collaborate with other higher education institutions and organizations to share best practices and research findings on climate adaptation.

Strategies for living with climate uncertainty

Strategies	Definition	Examples
Low regret	Measures that yield benefits regardless of the climate change outlook	Real-time monitoring and forecasting fluvial flood risk factors; upgrading infrastructure to higher specification on replacement
Reversible	Measures that aim to keep as low as possible the cost of being wrong	Easy to retrofit coastal defences that enable cheap upgrades if sea level rise accelerates; restrictive urban planning and land use zoning
Safety margin	Extra 'headroom' to absorb climate change and reduce vulnerability at zero or low cost	Precautionary allowance applied to peak river flows or extreme sea levels to account for climate change in infrastructure design
Soft	Institutional or financial measures that plan for and/or spread risks	Land use zoning, early warning systems and insurance schemes; land set aside for flood water retention
Shorten time horizon	Uncertainty in future climate conditions countered by reducing the lifetime of investments	Cheaper or modular infrastructure that can be replaced on shorter cycles as risk of flooding increases
Integrated	Manage positive and negative side-effects of adaptation, including trade-offs with mitigation or benefits across different sectors	Restore salt marsh or mangrove habitats to enhance biodiversity whilst improving coastal flood/erosion protection

Adapted from: Hallegatte (2009)

Low regret options (flood risk management)



Link: The National Archives

The 2007 Pitt Review
15 urgent recommendations

1. Monitor groundwater levels systematically
2. Identify highest risk surface flood areas
3. Develop policy for demountable defences
4. Review local water rescue capabilities
5. Review adequacy of designated rest centres
6. Consider stockpiling equipment/consumables
7. Clarify role/ accountabilities (health guidance)
8. Identify and plan for most vulnerable people
9. Develop national flood emergency framework
10. List critical infrastructure
11. Extend telephone warning schemes
12. Enhance plans for ‘door knocking’
13. Involve local media in preparedness/ response
14. Encourage public to make flood kits
15. Persuade public to follow EA advice

Limiting lock-in and mal-adaptation

Lock-in refers to situations where investments or decisions made to adapt to present climate conditions inadvertently constrain future options or hinder transition to more flexible or sustainable adaptation strategies

60% of all subsidence claims are caused by trees and vegetation
Source: Future Climate Info

Photo: Uni Compare

Low water trees
- Birch
- Elder
- Hazel
- Holly
- Hornbeam

High water trees
- Aspen
- Elm
- Oak
- Poplar
- Willow

Source: Woodland Trust

Pause for reflection

What low regret adaptation options might be readily available to my HEI?

What potential lock-in and mal-adaptations could arise at my HEI?

Which colleagues/ experts are best qualified to advise on the above options and issues?

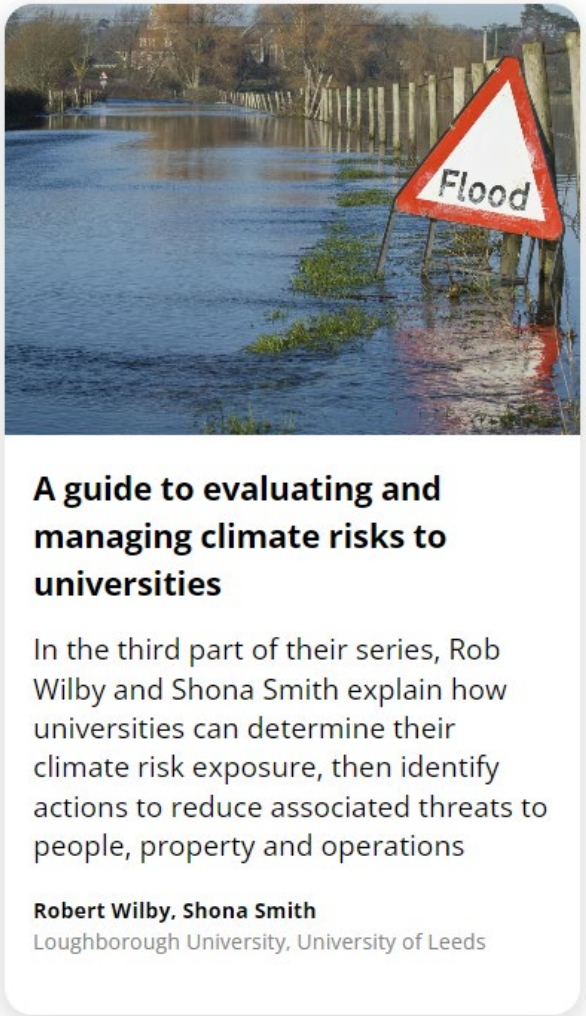
Where can ideas about potential adaptation options be found?

What adaptations can be deployed for previously unseen climate impacts?

Concluding remarks

- Apply climate risk assessment proactively to **target resources** at key vulnerabilities
- Use local **information** and **metrics** to benchmark present hazard likelihoods and consequences
- Deploy **low regret** adaptation options first
- Check for possible **lock-in** and **mal-adaptation**

Tasks for next week



1) Read THE Campus article on *A guide to evaluating and managing climate risks to universities*

2) Map your climate hazards (baseline and 2050s) onto a blank risk matrix (slide 19):

	Climate Risk Matrix (Damages £)		Consequence				
			Nuisance costs £100s	Minor costs £1000s	Moderate costs £10,000s	Major costs £100,000s	Disaster costs £1,000,000s
			1	2	3	4	5
Likelihood	Almost certain (most years)	5					
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	Rare (1 in 20 years)	1					

3) Suggest **3 adaptation options** for the most significant climate risk at your HEI