An Experiment on Systems Thinking : Climate Risk and Resilience

Moderators: Irem and Dragana

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Climate Resilient Built Environment - CRESBE - In Search for Systemic Resilience Pathways

- We use **systems thinking** to explore systemic impacts of climate change and decarbonisation and adaptation interventions to develop resilience heuristics at multiple scales.
- We explore the role of **digital technology** to navigate through uncertainty and complexity.
- We explore the **debates/narratives** to make sense of the institutional context in which resilient built environment is conceptualized, designed, and delivered.

University of Reading

Climate Resilient Built Environment Research Cluster (CRESBE) Series of Experiments : SYSTEMS THINKING IN ACTION 1:

Step 1. Practice : Let's talk about a simple risk situation - What does **SYSTEMS THINKING** mean for risk and resilience assessment ?

Step 2. The Case : Assessing climate risk and climate adaptation planning in HEI campuses - What is the difference between **SYSTEMS and REDUCTIONIST** approaches/methods ?

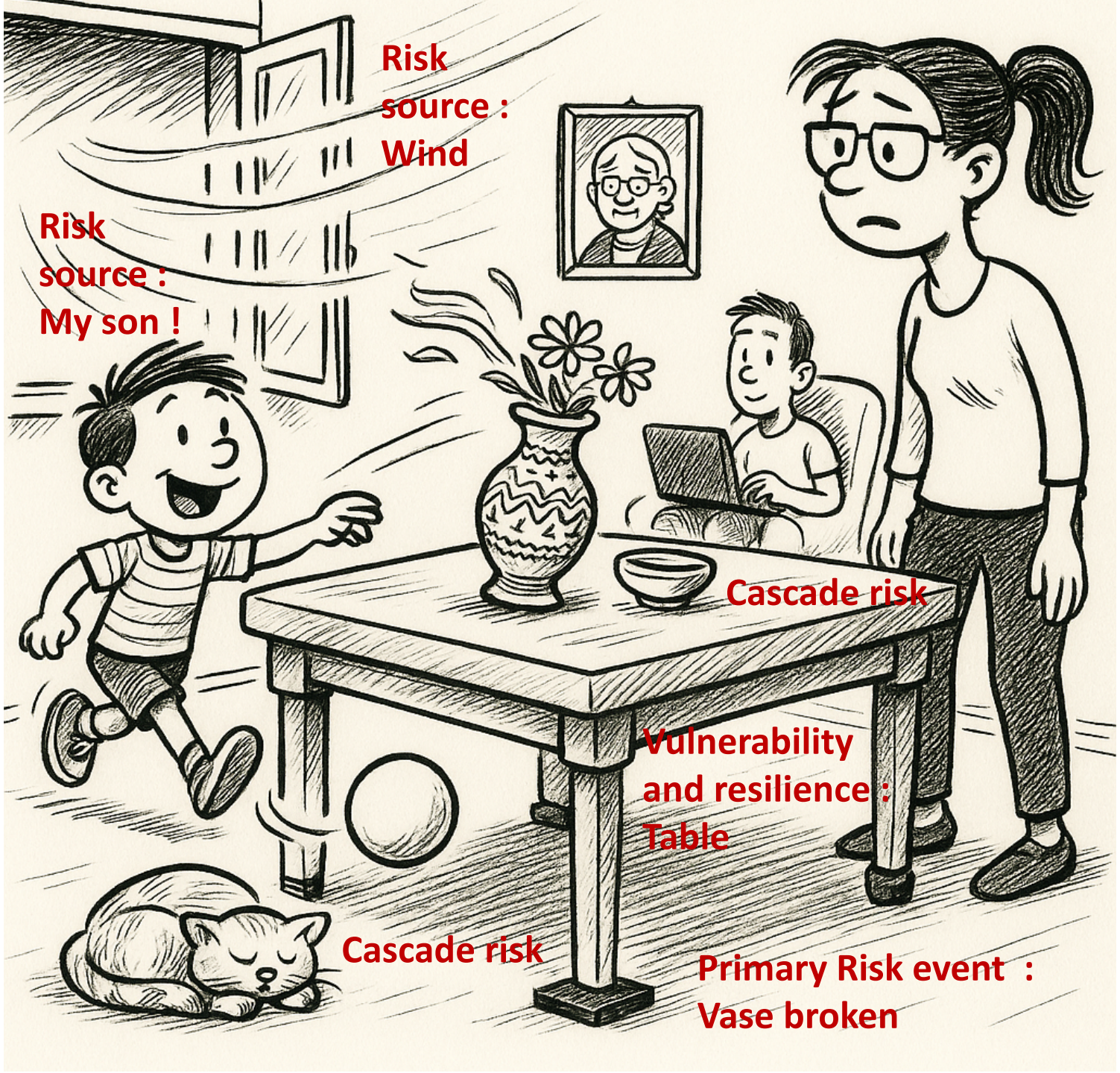
Step 3. Groupwork : Overheating risk in buildings - Visual metaphors about the process, or systems that help thinking in systems and taking meaningful actions

A simple risk situation and a metaphor

- Do the traditional methods such as RISK REGISTERS and RISK MATRICES reflect level of risk and its context in this situation ?

- How can we integrate systems thinking in project risk management ?

- Any visualization methods to facilitate talking about risk context and making sense of systemic project risk ?



A risk register

Risk	Probability	Impact	Mitigation Actions	Residual Probability	Residual Impact	Risk owner	Monitor
Vase is broken	High	High	Ensure boy will not play with the ball in the living room Protection of the vase (glue/fix) Strengthen the table (increase resilience) Close the window (risk elimination - partial) …	Low	High	Woman	Boy Table Vase Wind

- What is missing ?
- Implications for decision-making ?

Step 2.The Case :

"Assessing climate risk and strengthening resilience for UK Higher Education Institutions" by UUCN

UUCN UK Universities Climate Network

Working paper | March 2023

Assessing climate risk and strengthening resilience for UK Higher Education Institutions

KEY MESSAGES

- **Incorporate climate risk indicators into risk registries** as the first step towards acknowledging their importance and identifying and managing existing and anticipated climate risks and priorities for adaptation including consideration of risks to overseas activities.
- **Prepare for current and future climate impacts through resilient net zero planning** by taking a twin-tracked approach to climate mitigation and resilience that recognises the interconnected nature of protecting against climate risks whilst also reducing climate change.
- **Consider climate risk exposure beyond the physical footprint of the campus or site(s),** including climate risk assessment and the development of adaptation and resilience plans for neighbouring communities and critical infrastructure, transnational educational offerings, field work, international research collaborations and international supply chains.
- **Identify co-benefits and trade-offs amongst climate actions** because climate risks may interact with one another and with other non-climatic risks in the register.
- **Anticipate and manage transition risks** linked to evolving legal, policy, investment, market, and technology contexts under climate change, including the potential for stranded assets and reputational damage.
- **Draw on the skills and knowledge of different groups making up the institutional community when undertaking climate risk assessment,** recognising the process as both a technical and social endeavour.
- **Approach resilience building as an ongoing, open-ended process** requiring regular monitoring and evaluation to support reassessment of risks and ongoing development of adaptation plans.
- **Recognise that Higher and Further Education Institutions have important roles in building resilience to climate beyond their own operations and in terms of people and places** through their work and status as anchor institutions in local communities and regional economies.
- **Share insights and lessons learned about how to move to resilient net zero** with other institutions and sector, through forums such as the Alliance for Sustainability Leadership in Education (EAUC) Climate Risk Community of Practice and Universities UK fora.
- **Call on Government to give more attention to risks to education in the forthcoming Climate Change Risk Assessment (CCRA4)** and subsequent National Adaptation Plan, plus accelerate the release of data held by Government agencies and funded bodies to enable local climate risk assessment and adaptation planning.

Do the recommended “methods” and “processes” help HEIs operationalise “key messages” ?

Risk identification

Annex 1: Risks assessed in the CCRA[3], highlighting those most relevant to HEIs and FEIs.

	Natural Environment and Assets
N1	Risks to terrestrial species and habitats from changing climatic conditions and extreme events, including temperature change, water scarcity, wildfire, flooding, wind, and altered hydrology (including water scarcity, flooding and saline intrusion).
N2	Risks to terrestrial species and habitats from pests, pathogens and invasive species
N3	Opportunities from new species colonisations in terrestrial habitats
N4	Risk to soils from changing climatic conditions, including seasonal aridity and wetness.
N5	Risks/opportunities for natural carbon stores, carbon sequestration from changing climatic conditions, including temperature change and water scarcity
N6	Risks to and opportunities for agricultural and forestry productivity from extreme events and changing climatic conditions (including temperature change, water scarcity, wildfire, flooding, coastal erosion, wind and saline intrusion).
N7	Risks to agriculture from pests, pathogens and invasive species
N8	Risks to forestry from pests, pathogens and invasive species
N9	Opportunities for agricultural and forestry productivity from new/alternative species becoming suitable.
N10	Risks to aquifers and agricultural land from sea level rise, saltwater intrusion
N11	Risks to freshwater species and habitats from changing climatic conditions and extreme events, including higher water temperatures, flooding, water scarcity and phenological shifts.
N12	Risks to freshwater species and habitats from pests, pathogens and invasive species
N13	Opportunities to freshwater species and habitats from new species colonisations
N14	Risks to marine species, habitats and fisheries from changing climatic conditions, including ocean acidification and higher water temperatures.
N15	Opportunities to marine species, habitats and fisheries from changing climatic conditions
N16	Risks to marine species and habitats from pests, pathogens and invasive species
N17	Risks and opportunities to coastal species and habitats due to coastal flooding, erosion and climate factors.
N18	Risks and opportunities from climate change to landscape character
	Infrastructure
I1	Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures
I2	Risks to infrastructure services from river, surface water and groundwater flooding

Risk Assessment

Climate risk	Likelihood level	Consequence level				
		Nuisance costs (£100s)	Minor costs (£1000s)	Moderate costs (£10,000s)	Major costs (£100,000s)	Catastrophic costs (£1,000,000s)
		1	2	3	4	5
Description		Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain (most years)	**5**	5	10	15	20	25
Likely (1 in 2 years)	**4**	4	8	12	16	20
Possible (1 in 5 years)	**3**	3	6	9	12	15
Unlikely (1 in 10 year)	**2**	2	4	6	8	10
Rare (1 in 20 years)	**1**	1	2	3	4	5

Table 1: An example of a scoring matrix used for rapid appraisal of climate risk likelihood and consequence expressed here in terms of cost (£) of damages/interruptions.

Suggested actions

Table 2: Suggestions for actions from different groups making up the HEI and FEI community and stakeholders to support planning and practical action on climate resilience.

Stakeholder group	Suggested actions
HEI and FEI sector and sector bodies	• Develop sector briefs, guidance and training on climate risk assessment and management • Develop an accreditation scheme for institutional climate preparedness • Establish forums for the exchange of knowledge and good practice between education institutions on climate mitigation and adaptation • Develop position and policy statements around sector-wide issues such as security of supply chains, overseas sites and managing transition risks
Senior management	• Mainstream climate risks within the institutional risk register, business continuity planning, routine monitoring and reporting protocols • Align working groups for resilience, net zero and sustainability planning • Provide resources commensurate with the complexity and scale of the work • Assign clear roles and responsibilities for climate actions • Develop policy around responsible purchasing to consider Environmental Social Governance • Develop and resource training and education for staff and students in the skills needed for a resilient net zero transition • Drive action and accountability for climate risk and resilience by raising questions in senate
Professional staff	• Integrate physical and transition risk management to avoid asset stranding • Factor resilience into major infrastructure and procurement decision-making and financial reporting • Set up monitoring, evaluation and learning frameworks, recognising that climate risk assessment is an open-ended and iterative process • Publish climate risk indicators where they are visible and accessible, and actively seek engagement from the wider community • Openly share learning (both good and bad) with others in the sector and beyond
Academics and researchers	• Offer technical support on data gathering, climate risk assessment and hazard forecasting • Advocate strategies for decision-making under uncertainty • Identify low-regret adaptation options (i.e., those that yield benefits now and under climate change) • Support horizon-scanning activities for early uptake of new technologies, tools and frameworks for climate adaptation • Raise awareness of compound and cascade risks within your own institution and the wider sector • Embed student-centred climate change education including climate risk and resilience in all courses[17]
Students	• Participate in your HEI climate strategy through projects, fieldwork and citizen science initiatives • Raise awareness of climate risks and adaptation actions through student groups, societies, unions, residency representatives and campaigns • Support voluntary work to protect local biodiversity and blue-green spaces • Showcase your own actions to build resilience and reduce carbon emissions • Lobby senior management to raise ambition on climate risk management, just and resilient net zero transition

Systems Thinking in Action: Groupwork

Risk scenario : Overheating risk in buildings

The system parameters : Vulnerability (building parameters, occupant profile, urban context …), consequences (comfort, cost, health …), interventions/actions (passive design, AC, raising awareness, …)

A visual metaphor that helps thinking in systems (as opposed to reductionist methods such as risk registers)