

The voice of our sustainable built environment

A COMPENDIUM OF EXPERIENCE PHYSICAL RISKLABS



JUNE 2023



CONTENTS

	PAGE
EXECUTIVE SUMMARY	3
INTRODUCTION	4-9
REFLECTIONS	10-13
CASE STUDIES	14-19
KEY TAKEAWAYS AND NEXT STEPS	21
ACKNOWLEDGEMENTS	22

WITH THANKS TO OUR RESILIENCE AND NATURE PROGRAMME PARTNERS:

BURO HAPPOLD HOAF

HOARE LEA (H.) Hydrock



AND OUR PHYSICAL RISK LABS PROJECT PARTNERS:







EXECUTIVE SUMMARY





THIS IS A CRITICAL TIME FOR CLIMATE ACTION

In the most recent assessment of climate-related risks the UK is facing, over 60% were given the highest urgency score, a staggering increase in urgency compared to the previous assessment. Destructive climate impacts and extreme weather changes will affect all members of our society, and have a detrimental impact on the buildings, infrastructure and environments that keep us secure from hazards such as flooding and overheating.

Climate adaptation action alongside efforts to reduce greenhouse gas emissions is crucial, however, we first need to identify and understand the risks we face before we can begin to adapt our built environment to these climate hazards.

In August 2022, a group of asset-owning organisations and designers came together to participate in a sixmonth collaborative project called the **Physical Risk Labs**. The overarching goal of the project was to identify remaining challenges faced in the industry related to climate resilience and adaptation, work together to identify solutions and produce case studies of physical risk assessments in action using UKGBC's framework for measuring and reporting physical risks.

This project overview report summarises the experiences of the group; showcasing key insights, lessons learnt, reflections and case studies of physical risk assessments on real life assets to help those approaching and undertaking their own physical risk assessments. The insights provided by this report will primarily be of use to asset-owning organisations and their teams responsible for climate resilience or TCFD disclosure statements. However, it may also be helpful for other organisations seeking to evaluate climate-related risks on new and existing assets such as architects, designers and engineers

INTRODUCTION

WHAT WAS THE PHYSICAL RISK LABS PROJECT?

The Physical Risk Labs project built on UKGBC's previous work which provides guidance on how to measure and report climate-related physical risks to built assets, putting the framework into practice.

The initial session convened the group to discuss and identify the key challenges still faced when trying to measure and report climate-related risks (shown on page 6). The remaining sessions were used as touchpoints for the group to discuss these challenges, speak with external experts within the industry on specific challenges, work through the physical risk assessment framework on real life assets and gather feedback from peers when facing new situations and challenges. Although each organisations' approach to the lab varied, the key objectives of the Physical Risk Labs project were:

- To create a shared understanding of the physical risk assessment process.
- To identify the remaining challenges that asset owners and developers face when measuring and reporting climate-related physical risks to built assets.
- To use peer learning and call upon external experts to identify solutions to challenges, including for different asset characteristics.
- To produce case studies to demonstrate to industry the physical risk assessment process for a variety of new and existing assets.





Physical Risk Labs partners attending the first session to discuss the initial challenges facing the built environment industry when measuring and reporting climaterelated physical risks.



INTRODUCTION CONTINUED



HOW TO MEASURE AND REPORT PHYSICAL RISK

Throughout the lab sessions, the group used the **Framework for Measuring and Reporting Physical Risks** report and assessment tool to assess the climate-related risks for their individual assets.

This framework was co-created by an industry task group and launched in February 2022 to increase the amount, quality and consistency of built asset level physical risk assessments and reporting. It aimed to provide organisations and individuals with the knowledge and tools to undertake self-analysis of physical risks at the asset level, whilst also helping organisations prepare for the Task Force on Climate-Related Financial Disclosures (TCFD) aligned reporting requirements mandated by the UK Government from April 2022.

KEY INSIGHTS FOUND IN THE LAB

A main aspect of the Lab was to try and derive general observations and common conclusions around physical risk assessments across different teams and built asset types. Below we set out our five key insights from the project:

A number of challenges remain. Climaterelated risk assessment and adaptation action in the built environment is still within its infancy, with a number of issues blocking progress. The challenges identified by the group can be found on page six, ranging from lesser to greater challenges (top to bottom).

Collaboration is crucial. Boundaries of risk responsibility are not always clear, and the decisions made for one asset can easily influence risk on nearby assets and communities. Communication and early engagement with local stakeholders is key. Similarly, cross-sector collaboration is vital for addressing knowledge gaps and working together to create consensus on risk assessment methodologies and processes.

Detailed data is still lacking.

To comprehensively assess a range of hazards, detailed climate projection data at a local level is required. The group found that useful, free-to-use data is not yet available for all hazards.

Anticipating uncertainty is complex. Multiple climate scenarios, interdependencies between risks and cascading knock-on effects can make it difficult to meaningfully assess risk to assets. Further work, both within the industry and beyond, is needed to develop ways of including these elements within risk assessments.

5 Metrics and targets are needed. Translating climate projection data into likelihood of occurrence is difficult and further guidance is needed. Some teams developed their own parameters for hazard event likelihood to feed into their risk assessments.

In the final session, the also group reflected on their physical risk assessment journeys against the reporting flowchart set out in the framework report. This flowchart showing key steps for organisations to take when completing physical risk assessments can be found on page eight, with the group's additions included.

The remainder of this report provides an overview of the key insights taken from the lab sessions, alongside case studies of physical risk assessments across a range of asset types. The group hope that by sharing their



experiences, others within the built environment industry can learn from them and improve their own approaches to climaterelated risk assessment and adaptation.





REFLECTIONS: BURO HAPPOLD

The IPCC has reported that global greenhouse gas emissions have continued to increase, and that global surface temperatures have risen to 1.1°C above pre-industrial levels. Changes in our global climate associated with 1.1°C of warming are already locked in. The hazards linked to this level of warming are locked in also; every further increment of global warming will intensify these. The UK Climate Change Committee (CCC) have been abundantly clear that action to keep pace with the impacts of a warming planet and increasing risk of a changing climate is insufficient across the UK.

Perhaps uncertainty has been delaying action to build resilience and adaptive capacity? Uncertainty in just how much more warming will occur; uncertainty as to the hazards associated with this; uncertainty of the tipping points in natural systems; uncertainty of where to invest first to build resilience to physical risks; uncertainty of how to manage assets in the face of such uncertainty. What is clear is that across the UK we are already witnessing the impacts of climate change. There are an estimated 2,000 heat-related deaths in the UK per year; current rates of soil erosion equate to £40million per annum in agricultural productivity losses; 596 railway stations and 3,544km of the UK's rail network are at risk from surface water flooding. We cannot delay any further.

Without bold action to reduce greenhouse gas emissions, risks associated with the changing climate will become greater. These risks are multiple and will interact, creating cascading impacts across the network of city systems that the functioning of the city and assets within it rely on. We must remember that action to build resilience and adaptive capacity is not separate from decarbonisation or equity actions. Deep, rapid and sustained decarbonisation is our best strategy in limiting the impacts of climate change. Marginalised and vulnerable communities are most likely to be most exposed and impacted by the risks of a changing climate. Programmes such as those we, at Buro Happold, delivered with C40 Cities, demonstrate that if the deep energy retrofit of housing is prioritised, at scale, in marginalised and vulnerable communities, multiple benefits can be realised. Significantly reducing greenhouse gas emissions, alleviating fuel poverty, reducing cold mortality and ill health, and thereby lowering work related absenteeism and hospital admissions.

1 IPCC (2023). AR6 Synthesis Report: Climate Change 2023. Online: https:// www.ipcc.ch/report/ sixth-assessment-report-cycle/

- 2 UK Climate Risk (2021). CCC: UK struggling to keep pace with climate impacts. Online: https://www. ukclimaterisk.org/newsroom/ uk-struggling-to-keep-pace-withclimate-impacts/
- 3 UK Climate Risk. (2021). Sector briefings. Online: https://www. ukclimaterisk.org/ independent-assessment-ccra3/ briefings/
- 4 Buro Happold. (2022). The multiple benefits of deep retrofit: a toolkit for cities. Online: https://www. burohappold.com/projects/ the-multiple-benefits-of-deepretrofits-a-toolkit-for-cities/



BURO HAPPOLD

UKGBC published the 'Framework for Measuring and Reporting of Climate-related Physical Risks to Built Assets' following the launch of the Task Force on Climate-related Financial Disclosures (TCFD). The Framework recognised the need to equip and support organisations to understand, consider, plan for and report against the physical risks posed to their assets by climate change. It was intended to support organisations in taking the initial steps to do this.

Participating within the Labs demonstrated the value of the Framework in facilitating inter-departmental dialogues within participating organisations. The critical nature of these inter-departmental dialogues is a key lesson learnt for all, as responsibility for building resilience spans from those setting the brief for new assets through to those managing existing. The organisational exchanges that were facilitated through the Labs also proved invaluable – in terms of facilitating learning, building new knowledge, establishing best practice, and avoiding maladaptation. These networks, internal and external, when rooted in trust can play a pivotal role in the built environment sector testing, discussing, and plotting roots through the multiple possible climate futures we must consider. Thereby, helping us unlock and accelerate action by navigating uncertainty.



FERGUS ANDERSON ASSOCIATE BURO HAPPOLD



REFLECTIONS: CLARION HOUSING GROUP

We were delighted to partner on this piece of important work, sharing learnings with cross-sector colleagues on climate risk whilst developing our approach in this area. Collaboration is key to tackling the impacts of climate change.

The World Economic Forum's Global Risks Report once again highlighted climate related risks as some of the most severe the world will face. The failure of climate change adaptation was listed as the second most severe risk for the globe in the next ten years, further cementing the urgency to act on this issue.

Clarion is the UK's biggest social landlord, with 125,000 homes across England. Understanding and mitigating the impacts of climate-related risk on both our assets and residents is a key part of our Group Sustainability Strategy. We have a long-term aspiration to ensure all residents in our communities are resilient to severe impacts from physical climate-related risks.







CLARION

HOUSING GROUP

As such, we are carrying out an extensive physical risk mapping exercise to evaluate the impacts of

multiple climate scenarios on our homes and residents. This key piece of work will enable us to effectively plan to mitigate those risks by introducing physical measures, such as cooling and solar shading, alongside understanding how we can work with our residents to reduce the health and wellbeing impacts of climate change.

The risk mapping will also be utilised by our Development Team to inform the design of Clarion's future developments, as well as informing investment decisions through our Investment Committee process. Traditionally new developments have only looked at overheating and flood risks in terms of mitigating the impacts of climate change. The UKGBC framework highlights the wider range of impacts that need to be addressed and helps project teams identify the potential risks to mitigate them during the site selection and design processes.

BECKY RITCHIE HEAD OF SUSTAINABILITY







CASE STUDY: JUBILEE CAMPUS (UNIVERSITY OF NOTTINGHAM AND HYDROCK)

HOW DID YOU APPROACH THE PHYSICAL RISK ASSESSMENT?

- We started with the existing information for the site from design records and site plans, along with a site visit to gain further understanding of how the site is currently dealing with physical risks. There were some limitations to the quality of the data from older buildings on the site.
- We obtained baseline climate data through the Met Office historical data and UKCP18 datasets to understand baseline climate conditions.
- Due to the nature of a campus site, buildings were grouped on year on construction due to similar construction types and building services, and how they respond to physical risks.
- The assets were then assessed on the likelihood of each physical risk occurring.

WHAT DID YOU LEARN FROM THE PHYSICAL RISK LABS?

- The discussions in the lab sessions on interacting data points that feed into the assessment of some climate hazards were particularly helpful in setting 'parameters' for risk through data analytics.
- We learnt that everyone was struggling with similar areas where there is a lack of sufficient data to fully assess at asset level the risks without further detailed studies (e.g. risks including an element of wind such as wildfire).
- The biggest takeaway from the labs was the deep dive into insurance related matters and being able to evidence adaptation innovations and interventions, particularly nature-based ones, with engineering and technical information to account for the absence of loss history and essentially demonstrate that these are helpful and not 'a problem' from an insurance perspective (e.g. water ingress for green walls/roofs which could substantially aid heat stress).



KEY FINDINGS FROM THE PROCESS:

- We wanted to visualise the results and the campus assessment meant that this was easier, but the risks had to be shown over timescales of short, medium, and long term rather than by risk – we did produce a 'summary' visual which captures the headline risk for assets which are actually different across the campus area.
- It was difficult to keep the level of detail per asset when scaling up the framework from an asset to a campus level of detail.
- Collating existing building information and the issues buildings were already experiencing was difficult when considering 20+ assets across the campus, and not spending vast amounts of time on site.
- You cannot easily create a risk register in the current physical risk framework to follow the process for multiple assets. A simplified framework format for dealing with large-scale developments would make similar assessments easier/quicker.



WHAT ARE THE NEXT STEPS?

- We would like more information on access to funding for implementation of adaptation measures to address highest physical risks.
- We would like to integrate physical risk into full adaptation plans where the focus is on business impacts rather than physical impacts – we have provided some text on this in our recommendations section.
- Acknowledging the gaps and ease of using UKCP18 data to refine UKGBC's framework as the data easily available does not have the granularity required for an accurate climate risk assessment, this meant delving into CEDA archives which allows for differences in methodology.

Photo: University of Nottingham campus



University of Nottingham UK | CHINA | MALAYSIA



CASE STUDY: Later Living Village (Retirement Villages and Hoare Lea)

HOW DID YOU APPROACH THE PHYSICAL RISK ASSESSMENT?

- Collaboration between Hoare Lea and Retirement Villages Group to perform assessment with regular meetings to discuss and apply the UKGBC framework for measuring and reporting climaterelated physical risk.
- Attendance to UKGBC's Physical Risk Lab workshops to learn approach and share findings.
- Review of later living village Castle in Berkhamsted. Assessment made based on asset features and geographical location. This included setting short, medium, and long term timescales for the risk assessments and considering the indirect risks to the asset.
- We used the Met Office's UK Climate Averages as the baseline data for the assessment. And then used the UK Climate Projections 2018 (UKCP18) and UK Climate Risk Indicators to assess the future scenarios and risks.
- We identified which physical risks the asset and occupants may be susceptible to in terms of likelihood and risk. We also considered the occupants of the asset where their age may mean they are more vulnerable to certain physical risks such as extreme temperatures.

WHAT DID YOU LEARN FROM THE PHYSICAL RISK LABS?

- One challenge was a lack of best practice around approaches to identify inherent vulnerabilities and resilience measures. To overcome this, we reviewed asset features and location.
- Another challenge was the lack of defined criteria for risk probability by physical hazard so we identified performance thresholds to overcome.
- Initially it was difficult to translate the climate projections in identified tools and data sets into the likelihood of physical hazard occurring. Physical hazard occurrence is typically a one-off for which monthly averages do not identify, however, you can use the trend data shown by changes to monthly averages to predict likelihood of physical hazard occurring.
- One outstanding challenge was identifying interdependencies between risks, no solution has yet been identified to overcome this.

KEY FINDINGS FROM THE PROCESS:

Challenge: not being able to identify clear guidance on cost evaluation.

Solution: identification of rough magnitude for cost. In a more detailed assessment we would involve a cost consultant. Aside from damage to the asset, costs could come from liabilities associated with exposing the residents to high-risk environments, this is more difficult to associate with a financial cost.

- One finding was the identification that heat stress is a "very high risk" to life due to the inherent vulnerability of overheating to later living residents as well as the projected hotter drier summers.
- Wildfire was identified as a "high risk" due to the increasingly hotter drier summers and the proximity of a woodland to the later living village. The impact of a fire could lead to loss of life as well as total or partial destruction of buildings.





WHAT ARE THE NEXT STEPS?

- To adopt a climate resilience target into Retirement Villages Group's sustainability strategy and create governance for delivery.
- Review the appropriateness of carrying out an assessment across whole portfolio of later living villages. This process could be repeated every 5 years to ensure emerging risks are accounted for as recommended in the EU Taxonomy.
- Using this initial exercise, where high risks are identified more detailed assessments could be carried out along with adaptation and risk management strategies.
- To work towards reporting through the TCFD framework.

Left photo: Castle Village

Above photo: Castle Village mansion





CASE STUDY: Major infrastructure (HS2)

HOW DID YOU APPROACH THE PHYSICAL RISK ASSESSMENT?

- We are building HS2 to be the most sustainable railway of its type in the world, including making it resilient to our changing climate such that it can operate into the 22nd century. We have embedded climate resilience thinking into all stages of the HS2 project and are continually seeking to enhance our understanding of climate-related topics, minimise risks and optimise available opportunities.
- Our planning statements include route-wide climate change risk assessments that assess the potential impacts of climate change on HS2 assets at a routewide level. The framework from UKGBC was used specifically at 3 assets as part of this assessment.
- Understanding of climate change, including development of new climate projections, is progressively evolving. This progression coincides with HS2 asset designs developing and construction occurring.
- We used the UKGBC Physical Risk Assessment framework to build on our previous understanding of risks at an asset level taking into account the further design information that is now available and using the UKCP18 climate projections.

WHAT DID YOU LEARN FROM THE PHYSICAL RISK LABS?

- Participating in the Physical Risk Lab Sessions has been a useful exercise to collaborate with industry peers in the built environment. At HS2 Ltd, we are committed to working across industry groups to share best practice and collaborate on climaterelated challenges to improve understanding and encourage greater resilience.
- The Physical Risk Labs have furthered our understanding of current best practice for conducting a physical risk assessment on built environment assets.
- We are encouraged to see increased consensus on key issues such as the consideration of multiple climate projections in risk assessments and the need for frequent re-analysis (for example, using different climate scenarios for planning and design, and sensitivity testing).
- Our work in the labs has also highlighted the importance of considering climate resilience as early as possible in the built environment sector, something that we are proud HS2 Ltd has been doing from its inception.

KEY FINDINGS FROM THE PROCESS:

- Using the UKGBC Physical Risk Framework at an asset level provided us with a deeper understanding of specific climate-related risks, including those influenced by the asset design or site location. This assessment highlighted where HS2 designs are using innovative methods to increase resilience to climate change and how our risks might change depending on the future climate scenario considered.
- We are a major infrastructure project with a large number of assets. For example in Phase One (London to West Midlands) alone we will build 140 miles of dedicated track, four brand new stations, two depots, 64 miles of tunnels and over 500 bridging structures. To maintain proportionality whilst appropriately assessing risks, we have conducted separate risk assessments at an asset group level for all phases of HS2. The UKGBC Physical Risk Framework then allows us to expand on these assessments where needed. A more detailed and granular asset-specific assessments could be warranted for example due to specific engineering design or increased vulnerability of an asset.
- Our society is highly interconnected and businesses therefore have many associated interdependencies with external organisations. We recognised this as an area of ongoing work in our latest Adaptation and Resilience Report and believe a holistic system thinking approach is needed to address the issues. The Physical Risk Labs provided us with an opportunity to speak to other sectors and businesses and understand potential interdependencies risks in more detail.





WHAT ARE THE NEXT STEPS?

- HS2 is in the design and construction phase with Phase One (London to West Midlands) anticipated to be operational between 2029 and 2033. The construction of many of our assets are considered mega projects in their own right with design and construction timescales of several years due to their complexity. Our climate-related risk assessment, therefore, had to cover both a period of construction spanning this decade, and a period of operation continuing into the 22nd century.
- Different risks were found to be relevant to these different stages of our project which had to be accounted for during the risk assessment process. For example, in the construction period, we primarily face climate-related risks from extreme weather events, like those seen last year (e.g. July 2022's heatwave). These have the potential to affect our construction staff and have programme implications unless mitigated. In operation, climate-related risks associated with longer-term shifts in climate could affect the resilience of HS2's built assets and their operation.
- To address this issue, we added an additional timestep into the assessment to consider climate risks in the near term during the construction period. The modified risk assessment, therefore, identifies where additional resilience measures are needed at all stages of our project to ensure we build a resilient railway fit for the future.

Left image: HS2 River Cole viaduct visual

Above image: HS2 Interchange station visual





KEY TAKEAWAYS

NEXT STEPS

The insights and learnings found in the lab sessions will be taken to help develop the next version of the **Framework for Measuring and Reporting Climaterelated Risks to Built Assets**. We intend to update the downloadable resource to be more user friendly, and include suggestions the Lab group identified during the project, particularly around the remaining challenges identified.

Alongside this, as noted by the Climate Change Committee, the UK currently lacks associated targets or goals for climate resilience standards at a national, local or sectoral level, vital for galvanising climate adaptation action. This is reflected in <u>UKGBC's 2025 strategy</u> which identifies the need to define these targets through collaborative research and engagement with the wider built environment industry. The next phase of work under UKGBC's Resilience and Nature programme will be co-creating these science-based, sector wide targets through our Resilience Roadmap project.

For more information about this report, the **Resilience Roadmap** project or the **Resilience and Nature Programme** in general please **CONTACT US.**



WE WOULD LIKE TO SEE **TO ENSURE T** EXISTING BUILDING STOCK IS ΔΠΔΡ CII ARI TN E-RELATED AND FIIT FC ΜΔΙ **RISKS. THIS WOULD MEAN** PROVIDING GUIDANCE AND **MECHANISMS TO ENABLE** ADAPTATION AT SCALE.



ROBERT WINCH SENIOR ESG CONSULTANT HOARE LEA

IN ADDITION TO IGATING OUR IMPACT WE ARE IG TO PROT OUR FCT FROM IH AGFS ELITURF AI IMATF-ISKS. THROUGH THIS FN R APPROACH WE CAN CREATE HEALTHIER MORE RESILIENT COMMUNITIES.



NICK JONES PRODUCT & SERVICES DIRECTOR RETIREMENT VILLAGES GROUP

THE UK BUILT VIRONMENT CRUCIALLY LACKS DEFINITIONS, SCIENCE-**BASED METRICS AND** WIDE TARGETS TO IDUSTRY-PROF FANINGFU E RESII **C** IFNCF ACTION ΙΜΔΤ UKGBC NOW AIM TO LEAD THE **CREATION OF THESE THROUGH OUR UPCOMING RESILIENCE ROADMAP PROJECT.**





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