NATURANCE

Urban heatwaves: establishing risk financing strategies for emergency response plans and nature-based risk reduction measures

WTW

Innovation Lab 1

26th November 2024

NATURANCE ("Nature for Insurance, Insurance for Nature")

Goal

to evaluate the **technical**, **financial**, and **operational** feasibility and performance of solutions that integrate and combine disaster risk financing and investments with nature-based solutions

Specific objectives

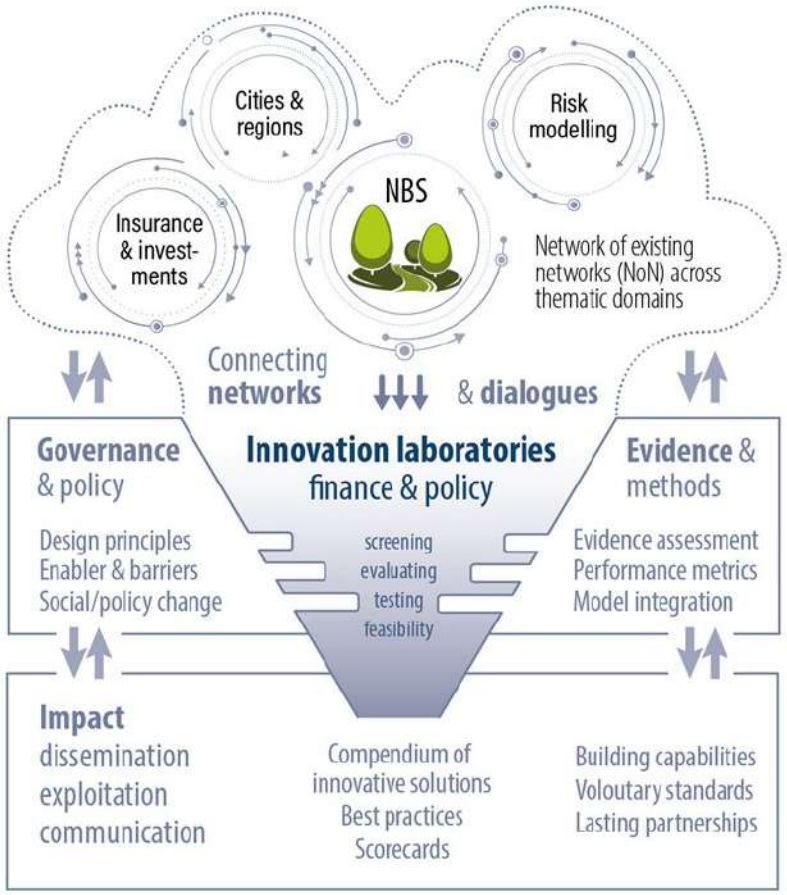
Connect major knowledge networks and foster knowledge sharing and collaborative marketplace for innovative solutions.

Organise innovation finance and policy labs to assess areas for insurance & investment solutions.

Analyse policy and governance conditions conducive for the solutions.

Analyse models, methods, scenarios, and metrics.

Build capabilities for green financial innovations, and creating conditions for transformative change



Innovation Labs

An **“Innovation Lab”** is a small-group discussion where experts from diverse institutions come together to innovate and generate novel solutions to a common challenge.

A **key outcome** is the development of city specific “innovative solution”

- **Lab 1 – Nov 2024 – problem definition & canvasing solutions**
- **Lab 2 – Jan 2025 – solution deep-dive in city #1**
- **Lab 3 – Feb 2025 – solution deep-dive in city #2**

University of Oxford · Smith School of Enterprise & Environment · Australasian Green Infrastructure Network · LSE · Grantham Research Institute on Climate Change and the Environment · UNU EHS · International Institute for Applied Systems Analysis (IIASA) www.iiasa.ac.at · Impact on Urban Health · London climate ready Partnership · CISL Cambridge Institute for Sustainability Leadership · ARUP · SHADE THE UK · ICLEI Local Governments for Sustainability EUROPE · MAYOR OF LONDON · LONDONASSEMBLY

Agenda

Timing (BST)	Description
2:00 pm – 2:15 pm	Introductions
2:15 pm – 2:30 pm	Introduction to the “problem statement” (WTW)
2:30 pm – 2:50 pm	Breakout session 1: “The **key challenges** associated with urban heatwaves, specifically those challenges standing in the way of obtaining financing for preparedness and response actions and protection and resilience-building for NbS/natural assets”
2:50 pm – 2:55 pm	Summary of breakout sessions
2:55 pm – 3:05 pm	Coffee Break
3:05 pm – 3:20 pm	Introduction to potential solutions to the problem statement (WTW)
3:20 pm – 3:40 pm	Breakout session 2: “Identify **priority population segments/natural assets**, required hazard information, and preparedness and response actions in the context of heat-waves and related information needs/gaps.”
3:40 pm - 3:45 pm	Summary of breakout sessions
3:45 pm - 4.00 pm	Closing remarks and next steps

Historical heatwave impacts in Europe

Urban heatwave impacts

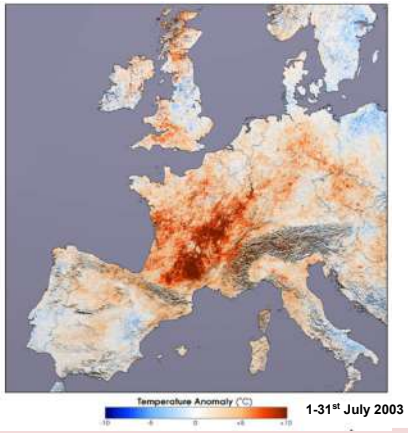
Identified solutions

Applying a disaster risk management framework

Section 1: impacts, solutions, and risk management framework

Timeline of key historic events impacting European Cities

European Heatwave 2003



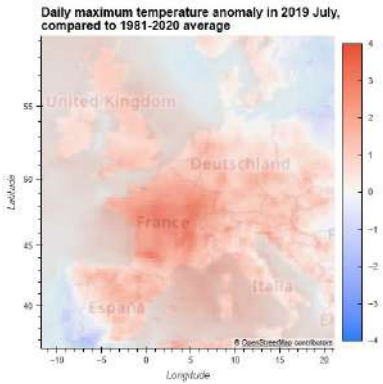
~70,000 excess deaths

Paris, Rome and London among most impacted cities

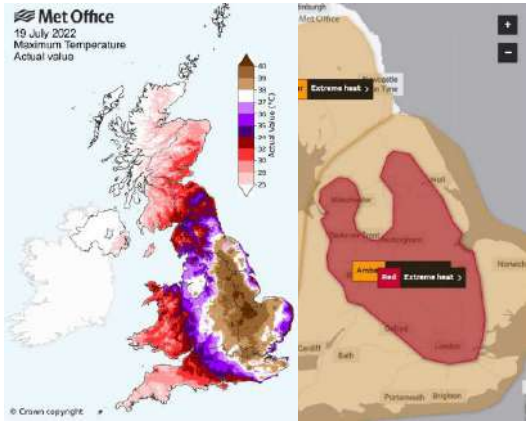
European Heatwave 2019

Infrastructure impacted due to extreme heat **(railways, air travel and roads)**

Public cooling centres at capacity in Paris



European Heatwave 2022



Western Europe and U.K.

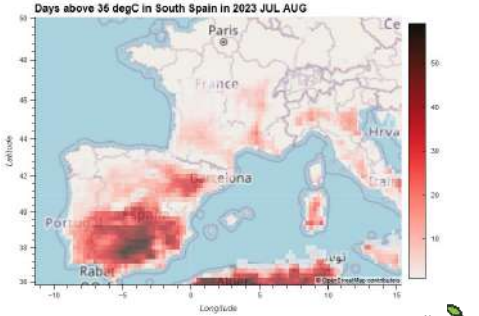
Over 61,000 heat-related deaths

First ever **extreme heat warning to be issued in UK (1/1000 year event)**

European Heatwave 2023

Southern Spain experienced up to 30 days of '**very strong heat stress'**

Milan and Paris hospitals saw surges in admissions



The Impact of Urban Heat

- Increased mortality rates, particularly of those in **care homes**
- Higher risk of acute stress for **vulnerable populations**, including **elderly, children, outdoor workers**
- Mental health impacts

People and Communities

- Existing buildings have been built to **keep out heat**, making them uncomfortable to work and sleep in
- Increase in **energy consumption for active cooling**
- **Railways/runways/roads buckling**

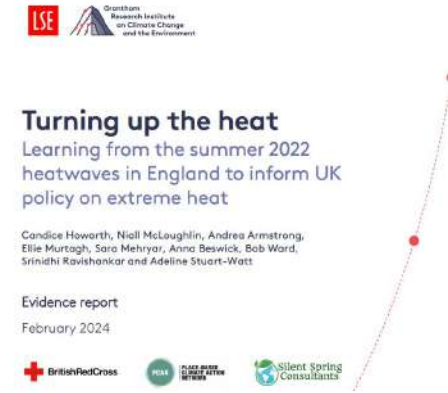
Built environment & Infrastructure

- Urban trees react to **heat stress**, leading to **observed death of trees in parks**
- **Water scarcity**, impacts BGI and leads to **cascading risks**
- **Increased pests and algae blooms**, impacting BGI

Blue-green infrastructure (BGI)

- **£260-300 million per year** in the UK economy
- **Reduced productivity** leading to a **loss in labour hours** as a result of heat exposure

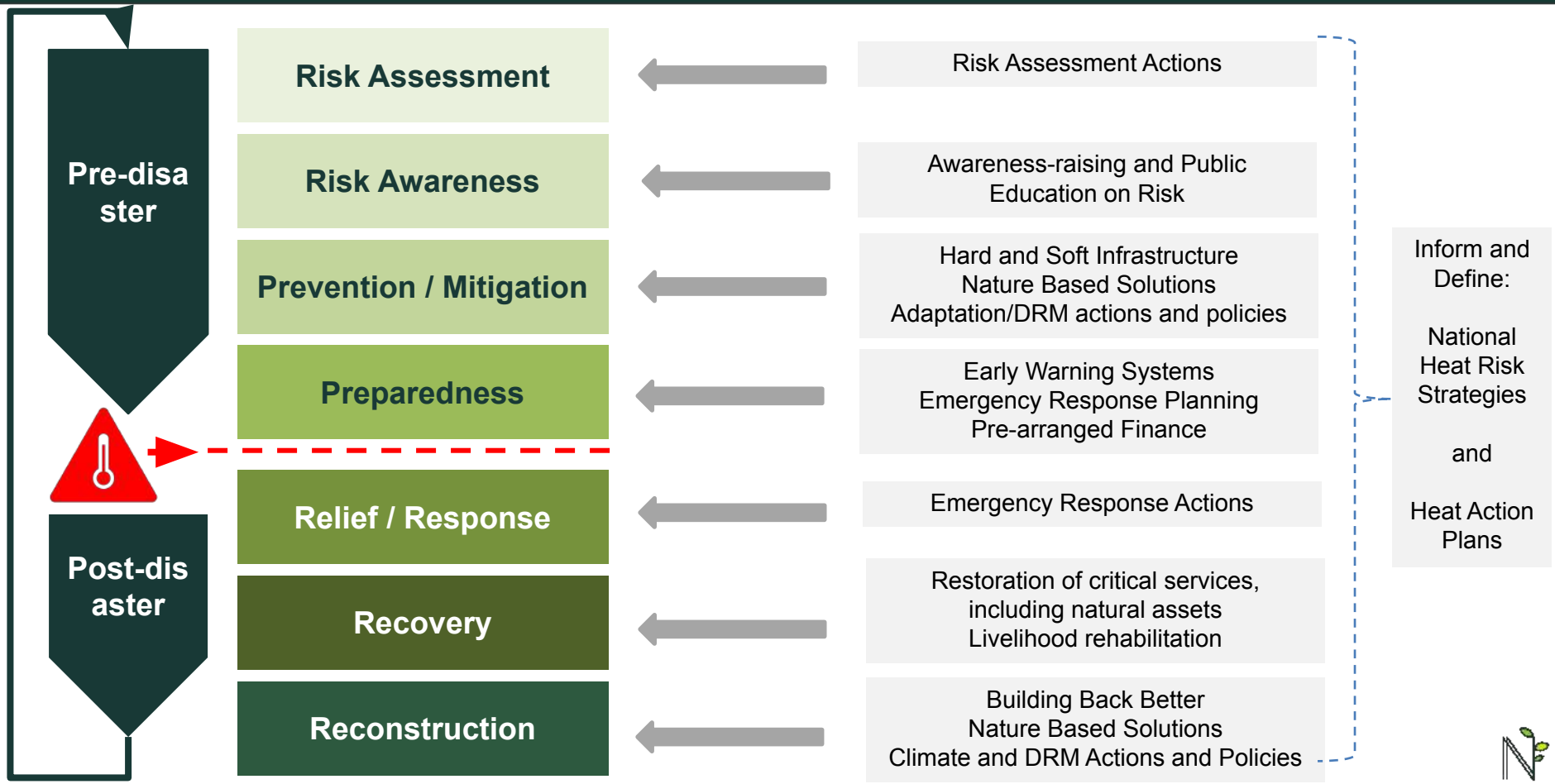
Economy



Solutions / Actions

Risk Assessment Actions	•Assessment of types of risk, their likelihood and possible impact. •Development of new modelling tools
Awareness-raising and Public Education on Risk	•Increase public education and training on heatwaves •Increase awareness of heatwave protection measures •Improve public messaging of heatwaves
Climate and Disaster Risk Management Actions	•Mitigation, adaptation and disaster risk management strategies
National Heat Risk Strategies	•Build on existing plans (e.g. Adverse Weather and Health Plan, National Adaptation Plan, National Heatwave Plan 2004) and develop specific disaster risk management (DRM) objectives for heat
Heat Plans	•Develop Heat (-Health) Action Plans •Introduce a threshold for inside temperature at which employees should not work
Hard and Soft Infrastructure Investment and Measures	•Retrofit existing buildings, build with climate resilient materials •Improve active cooling access, in an energy efficient manner •Increase care home resilience •Development and updating of relevant infrastructure standards and urban development policies
Nature-Based Solutions	•Increase uptake of trees in urban areas •Install green roofs and green walls •Maintenance of existing NbS
Preparedness and Emergency Response Planning	•Early Warning Systems •Including trainings and drills, e.g., Operation Helios
Emergency Response Actions	• Ensuring first responders have adequate resources (e.g., sufficient ambulances and fire services)

Disaster Risk Management framework – Solution/Actions Integration



Heat Action Plans

A Heat Action Plan can contain the actions required to execute the steps of the **Comprehensive Disaster Risk Management (CDRM)**

European cities are developing Heat Action Plans (HAPs) for integrating heat-relevant actions into climate action plans to outline how to respond to heatwaves.

These often focus on the health impacts of heat.

These also often refer to the implementation of nature-based infrastructure but there is **lack of clarity on how these would be funded, and there is variation in ambition and implementation across cities.**

Key Challenge

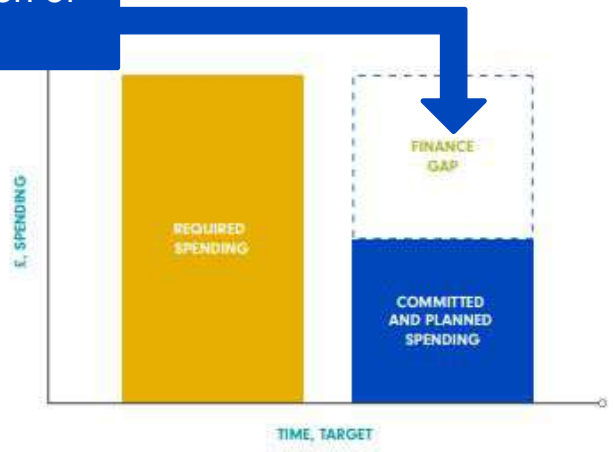
Lack of clarity **on** **ing** of HAP actions

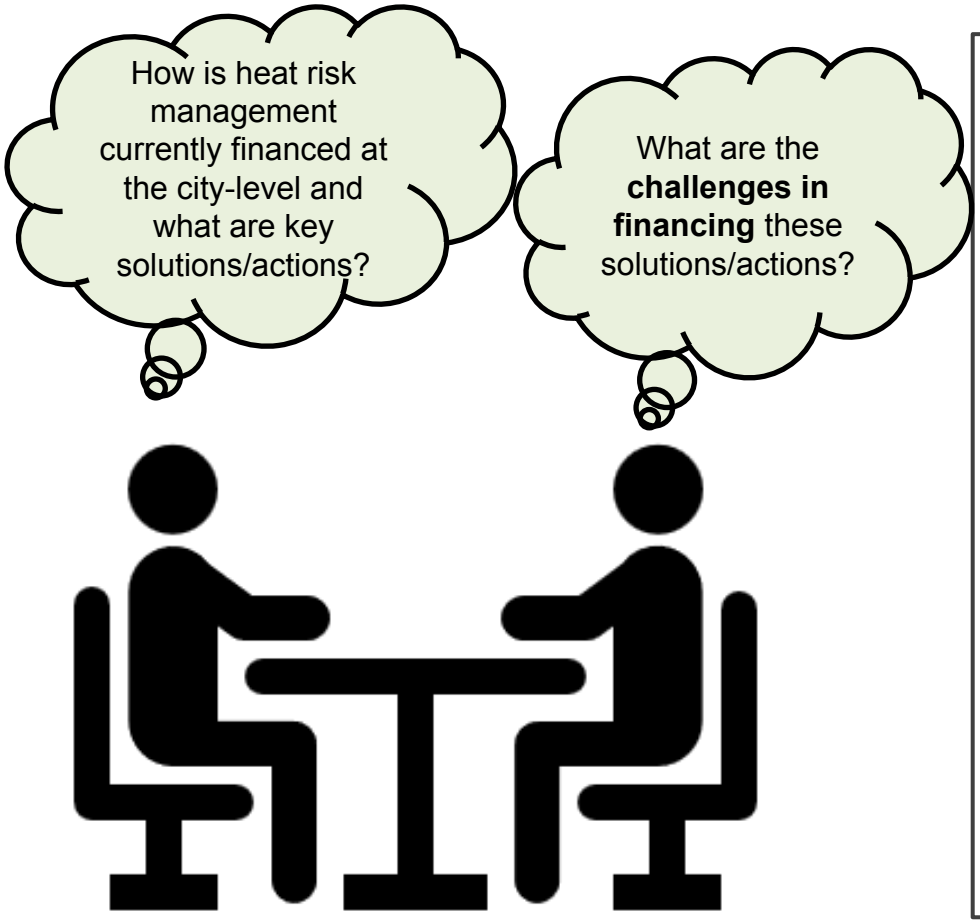
FINANCING GAP

In 2023 National Audit Office found that the **Government could not provide examples of any funding and investment** being made to manage the risk of heatwaves.

In the UK, a **£976 million** spending gap exists for the provision of **accessible green and blue spaces.**

What are the challenges in financing the identified solutions / actions?





Breakout Room 1

The key challenges associated with urban heatwaves, specifically those challenges standing in the way of obtaining financing for preparedness and response actions and protection and resilience-building for NbS/natural assets

Solutions / Actions

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Risk Information

Financial instruments for each part of the disaster risk management framework

Risk informed, trigger-based financing for managing urban heatwaves

Hazard indices

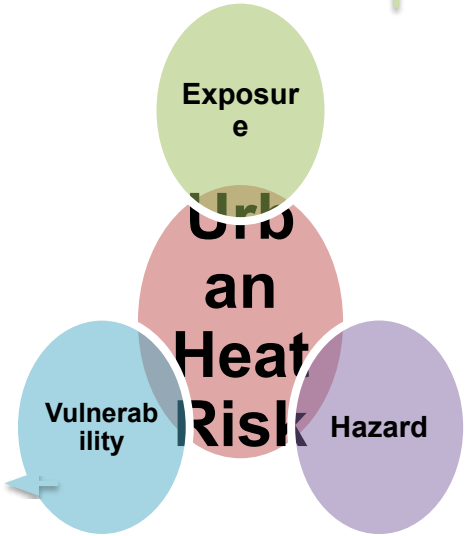
Case studies

Section 2a: Risk information, financial instruments, and heat related indices

Overview of risk information

A thorough understanding of **risk information** and **cross-sector collaboration** is crucial for all stages of the **Disaster Risk Management** framework and is required when developing **risk informed financing products.**

The assets/people at exposed to the impacts of urban heat (e.g., green spaces, people, critical infrastructure, response costs of relevant agencies)



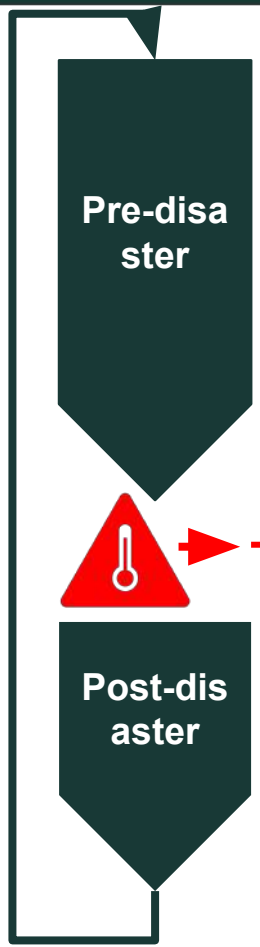
The characteristics of the exposure units which make them susceptible to the impacts of heat

(e.g., building material, age of population, underlying health conditions)

Temperature

This can be assessed through various **indices** (e.g., number of days above a temperature threshold, wet bulb temperature)

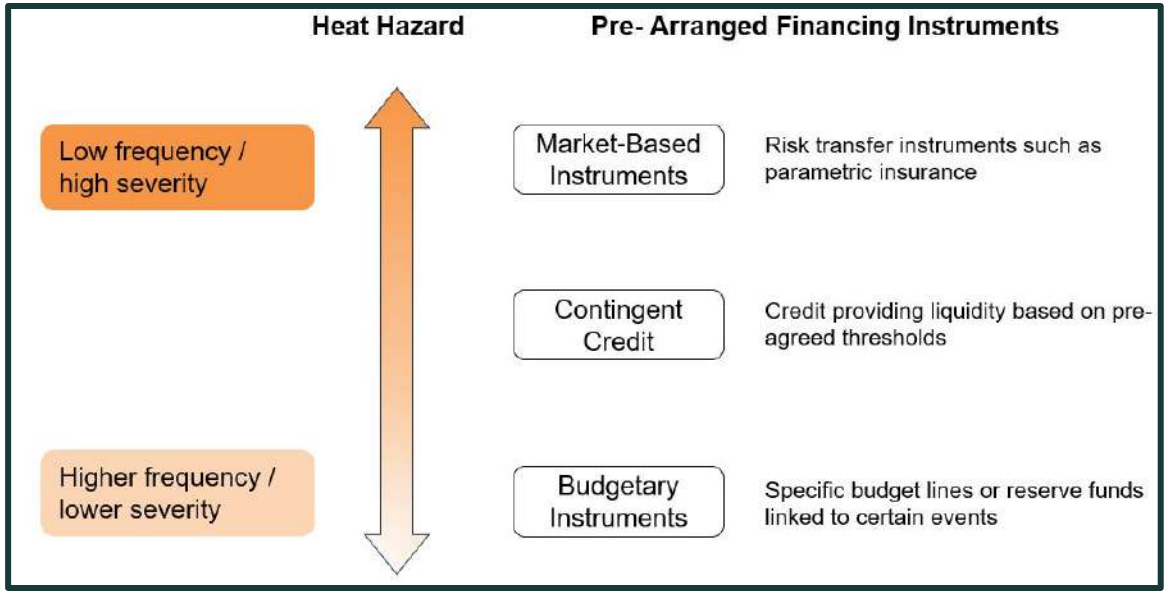
Disaster Risk Management framework – FINANCIAL INSTRUMENTS



Risk Awareness	Budget allocations, Disaster Prevention Funds, Loan/debt instruments
Risk Assessment	
Prevention / Mitigation	Budget allocation, Disaster Prevention Funds, Loan/debt instruments, incl. Resilience Bonds
Preparedness	Budget allocation, Emergency Response and/or Disaster Prevention Funds, **Trigger-based Finance**
Relief / Response	Budget re/allocation, Emergency Response Funds, Risk pooling and insurance, incl. **Trigger-based Finance,** Contingent Credit
Recovery	Budget re/allocation, Emergency Response Funds, Risk pooling and insurance, incl. **Trigger-based Finance,** Contingent Credit
Reconstruction	Budget re/allocation, Indemnity Insurance, ILS and Cat Bonds, Loan/debt instruments, incl. Resilient Reconstruction Loans and Resilience Bonds

Risk informed, trigger-based finance as an option to manage urban heatwaves

- **Guaranteed cash flow** once a pre-defined hazard threshold has been met
- **Fast payment** (e.g. parametric insurance payouts are usually made within 2 weeks)
- Financing instruments can be designed to pay before **(anticipatory action),** during or after an event **(parametric insurance)**
- Payment (or no payment) of the instrument can generally be understood (no grey areas)
- **Payout's uses are flexible** (e.g. **health, nature-based solution maintenance and restoration**)



Indices and trigger thresholds

To develop a trigger-based product, a thorough understanding of the hazard is required

Heat hazard indices can assess the severity of heat-related risks to people, infrastructure or ecosystems.

Define actual heat hazard

- For issuance of warnings
- For triggering of trigger-based finance

Determine trigger thresholds

- **Critical impacts for defined priority groups/ units** (e.g. elderly homes, homeless people)
- **Critical impacts on key natural assets** (for vulnerability to heat and mitigation function purposes)

Snapshot from ARUP's Urban Heat Snapshot, which analysed temperature in London, using the Urban Heat Island Intensity index. These tools can help identify areas in a city to direct resilience measures to.
https://www.arup.com/insights/publication-urban-heat-snapshot/

Indices and trigger thresholds

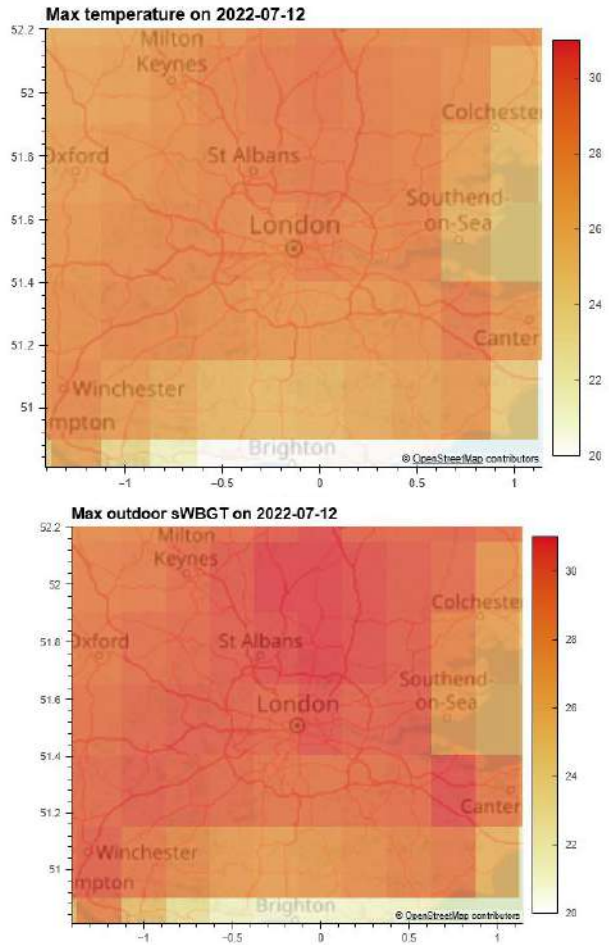
Human Health

- Heat Index (HI)
- Wet Bulb Globe Temperature
- Apparent Temperature (AT)
- Number of consecutive days above a temperature threshold
- Excess Heat Factor (EHF)

NbS/Greening

- Universal Thermal Climate Index (UTCI)
- Urban Heat Island (UHI) Intensity
- Surface Urban Heat Island (SUHI)
- Land Surface Temperature (LST)
- Annual Cooling Degree Days (CDD)

The key to managing heat hazards is that the **appropriate index and triggers** should be selected based on the **impact that is being captured / beneficiary of the finance.**

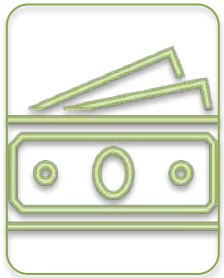


[Meaningful] financial cover

To develop a trigger-based product, a thorough understanding of the beneficiaries, needs and related response costs is required

Identify beneficiary groups/units

- **People:** Elderly, children, low-income settlements, homeless, hospitals/people in ill health,
- **Critical infrastructure services:** Water, power, transport, telecommunications
- **Natural assets:** Public green/parks, lakes/rivers, forests, etc.



Identify preparedness and response measures and their costs

- Depends on beneficiary group / unit
- Depends on timing, sequencing and required lead times of preparedness and response measures
- Depends on existing resource availability

Together, these actions all the selection of an appropriate:

(i) Index
(ii) Instrument
(iii) Coverage amount

Case studies for trigger-based risk financing for urban heat

1 Parametric insurance for urban heat in Ahmedabad and Bhavnagar, India

Home-based garment works in the city and downstream shipbreaking workers, work long hours **without mechanisms to manage heat**, resulting in **heatstroke and heat cramps.**

Beneficiary and policyholder: Members of the Self-Employed Women's Association (SEWA).

Trigger threshold: 3 consecutive days of daily temperature >= 43.6°C or 44.86 °C for garment workers and ship breakers, respectively. Additional payout if exceeded for 4th day.

Payout: Straight to bank account of policyholder, $3 dollars for first trigger, and $3 for the second trigger.

Women workers do not compromise their health through having to choose whether to protect their health or feed their families.

2 Anticipatory Action trigger development in Hanoi, Viet Nam

A programme developed in conjunction with **the local Met Office (IMHEN) and the Red Cross (Vietnam and Germany),** to **reduce human suffering** through the implementation of **anticipatory actions** in Hanoi.

Organisation holding funds: German Red Cross and Vietnam Red Cross

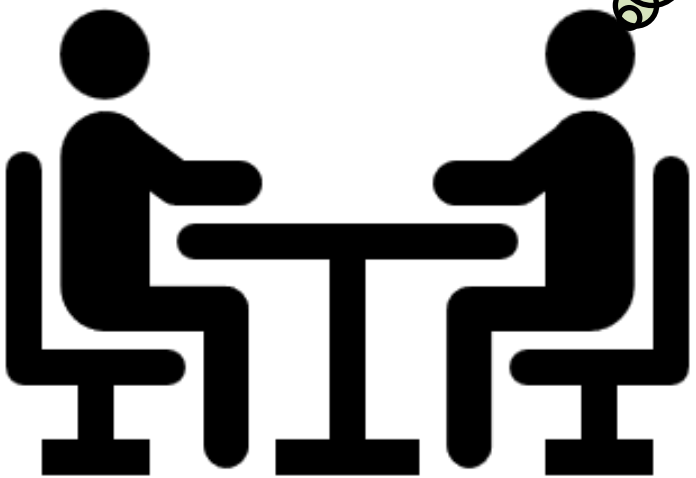
Trigger threshold: 2 or more days with temperature > 37°C **and** a forecast Heat Index exceeds the 1/100 return period

Payout: Two trigger mechanism at a lead time of 6 days and 3 days, if both thresholds are surpassed at 3 days, a payout **for is issued for moving people to cooling centres.**

Close collaboration between different sectors (e.g., forecasting, first responders) ensures action is taken at the right moment and at the right place.

Which beneficiary groups should be the focus, what risk information do we need to define trigger thresholds and what are relevant preparedness and response actions?

Which natural assets should be the focus, what risk information do we need to define trigger thresholds and what are relevant preparedness and response actions?



Breakout Room 2a

"*Identify priority population segments, required hazard information, and preparedness and response actions in the context of heat-waves and related information needs/gaps."*

Breakout Room 2b

"*Identify critical natural assets, required hazard information and preparedness and response actions in the context of heat-waves as well as related information needs/gaps."*

Closing Remarks and Next Steps

Innovation Lab 2 (London)

A **deeper dive** into a variety of specific use-cases which **incorporate disaster risk financing** for **preparedness and response actions, including NbS.**

Uses cases will be derived based on the discussion from IL 1.

A verified problem and financial solution, agreed by all of the participants.

Innovation Lab 3 (Germany/London tbc)

Critically discuss and test the verified problem and financial solution against a **pre-defined scorecard.**

A **critically discussed financial solution** in **"business case" format.**

Reference list including for images

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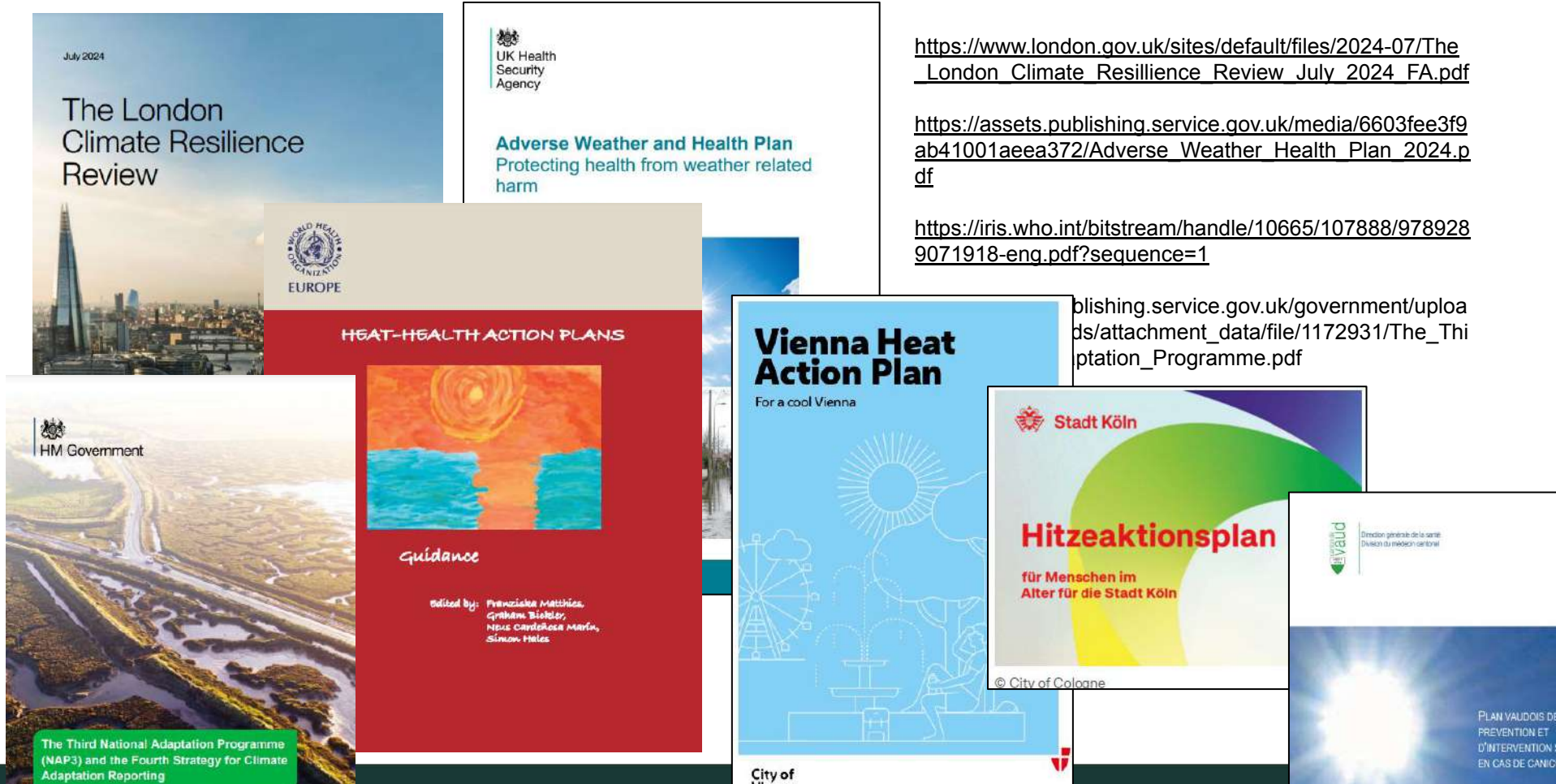
THANKS

Strategy



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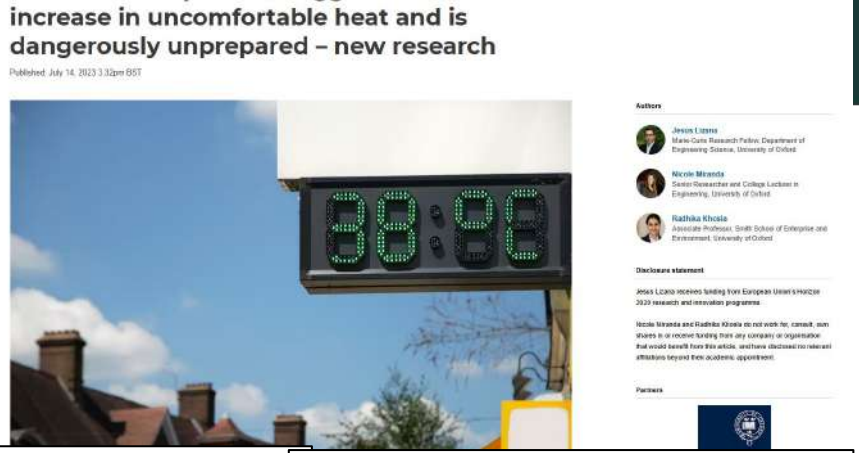
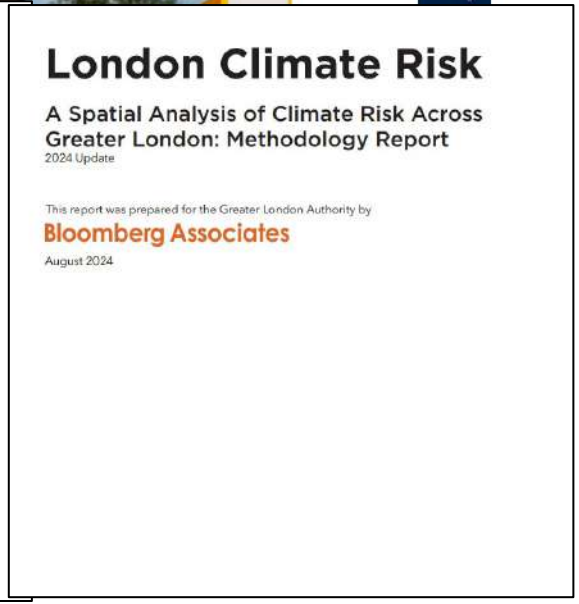
Impacts



Care Home Overheating Audit Pilot Project
Executive Summary
UCL



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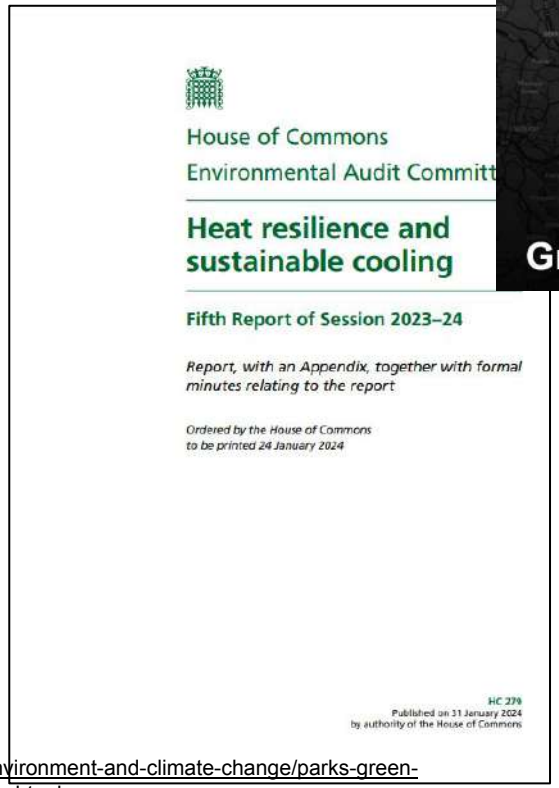
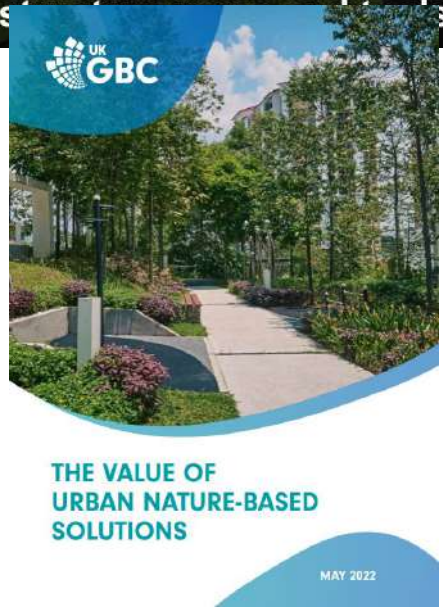
Solutions





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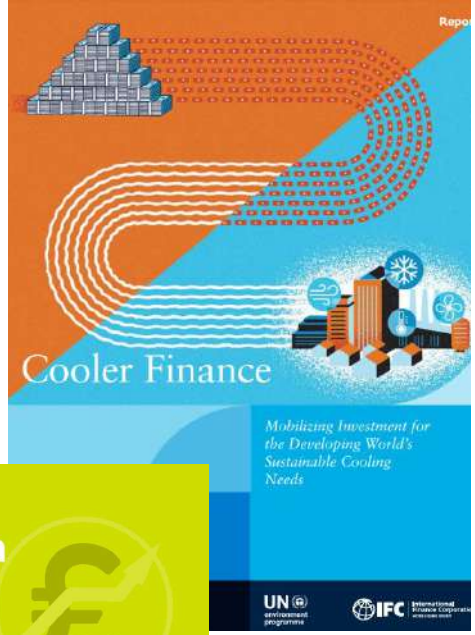


Finance

- https://www.pathways2resilience.eu/financing-regional-adaptation/
- https://www.theccc.org.uk/wp-content/uploads/2023/01/Barriers-to-financing-adaptation-actions-in-the-UK-Frontier-Economics-Paul-Watkiss-Associates.pdf
- https://www.ifc.org/en/insights-reports/2024/mobilizing-investment-for-the-developing-world-s-sustainable-cooling-needs
- https://www.eci.ox.ac.uk/sites/default/files/2023-12/Financing_NbS_for_Adaptation-GCAOxford2023-finalv2.pdf
- https://www.londoncouncils.gov.uk/sites/default/files/2024-09/London%20Borough%20Green%20Finance%20Guide%2C%20JL%20September%202024.pdf

Heat-Health Action Plans

A Heat-Health Action Plan can contain the actions required to execute the steps of the **Comprehensive Disaster Risk Management (CDRM)**

European cities are developing Heat-Health Action Plans (HHAPs) for integrating heat-relevant actions into climate action plans to outline how to respond to heatwaves.

There is variation in ambition and implementation across cities.

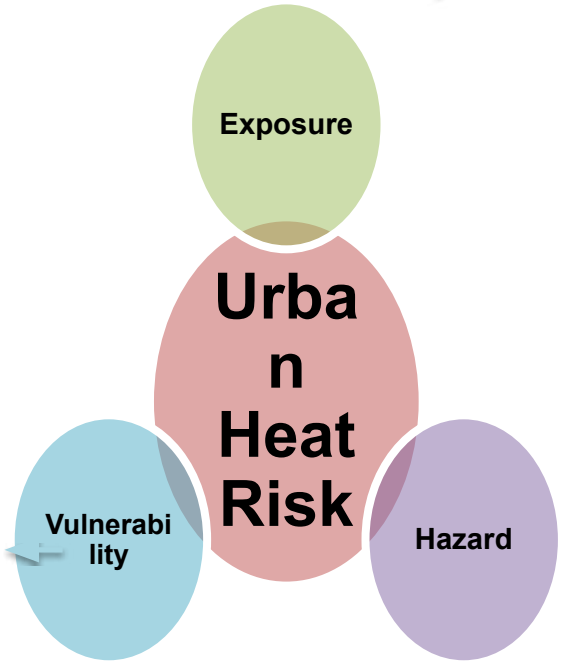
These also often refer to the implementation of nature-based infrastructure but there is **lack of clarity on how these would be funded, and there is variation in ambition and implementation across cities.**

Key Challenge

Lack of clarity **on** **ling** for HHAPs

Overview of a Risk Framework

The asset/people at exposed to the impacts of urban heat (e.g., green spaces, people, critical infrastructure, response costs of relevant agencies)



The characteristics of the exposure which make them susceptible to the impacts of heat

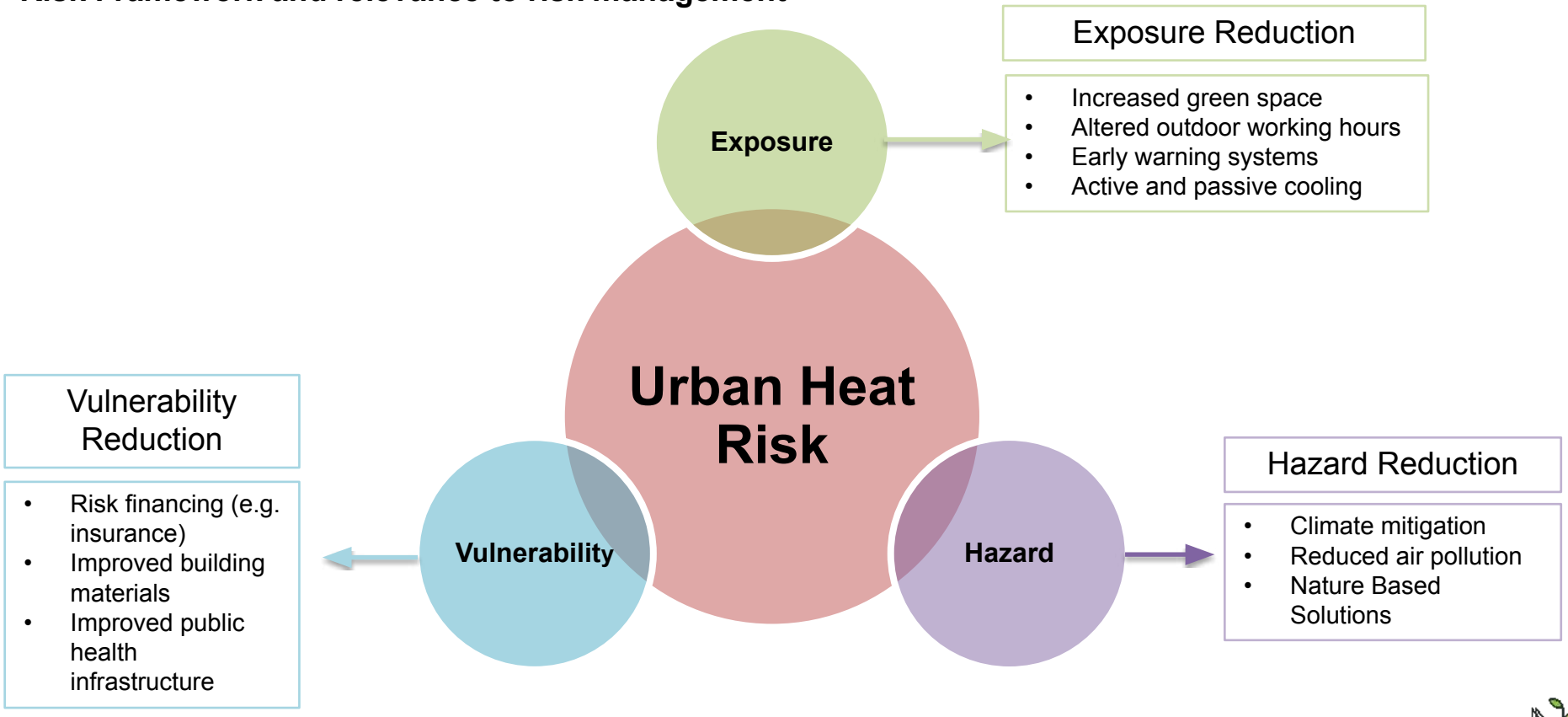
(e.g., building material, age of population, underlying health conditions)

Temperature

This can be assessed through various **indices** (e.g., number of days above a temperature threshold, wet bulb temperature)

The role of risk information in urban heat risk management

Risk Framework and relevance to risk management



Solutions / Actions

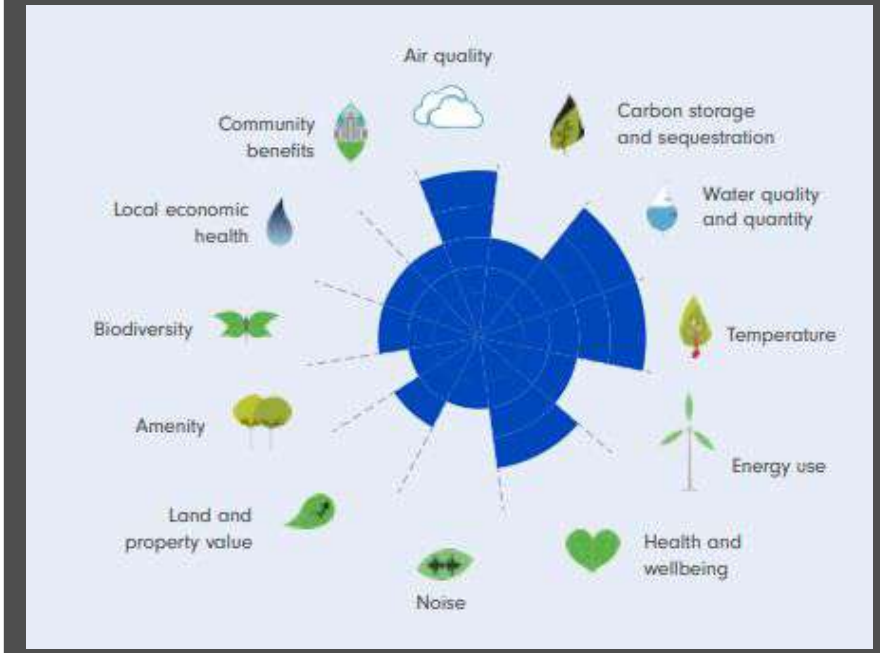
- Care homes can be made resilient to heat (LCRR) (E.g. window opening, nighttime ventilation as well as structural changes)

- Redesign of buildings (retrofit)

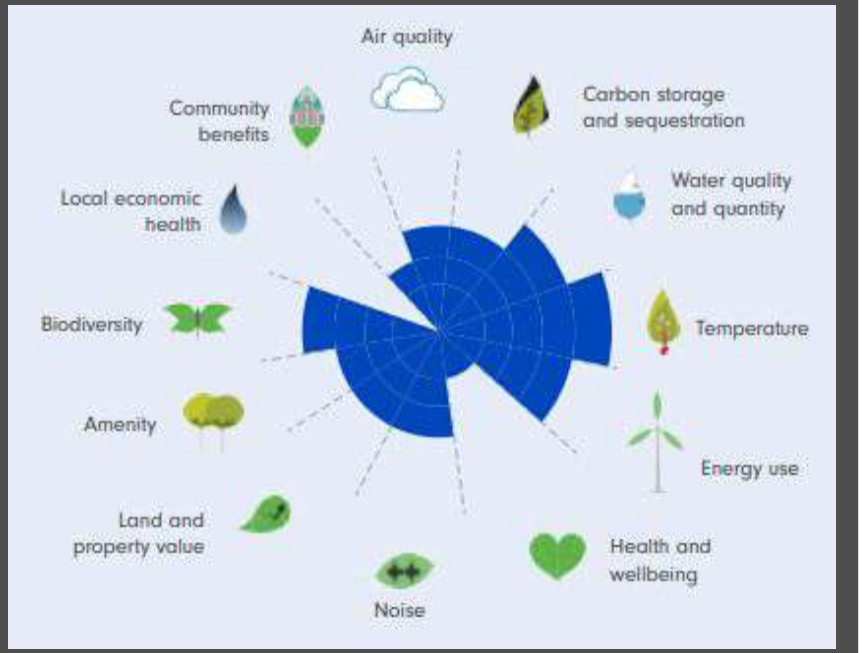
- NbS, e.g. trees positioned next to buildings can lower internal summer temperature by 4 degrees, and raise winter by 6 degrees, In comparison to no trees . Roofs can be painted white / made reflective. In turn reduces need for energy for cooling

The London Tree Officers Association said limited local authority resources to plan for extreme weather events leads to excess tree loss. Hammersmith and Fulham told us: “…trees and other green infrastructure were significantly compromised during the heatwave in 2022. Many newly planted trees failed because an increased and adaptive watering schedule was not in place”

Street Trees



Green Roofs



Westminster City Council said: “Westminster typically **has capital funding available for the introduction of greening assets and infrastructure** but does not have the required revenue funding to **support the maintenance of these assets in the long-term**.”

The challenges of financing Nature Based Solutions

Building Blocks of Trigger-Based Finance

Index Design

Hazard characteristics*

Relevant hazard typologies and associated characteristics, related data requirements and measurements/ metrics.

Insurance for …

Triggers / Thresholds

Critical impacts

To understand when event types produce problematic impacts, given the intensity of certain associated hazard characteristics (e.g., amount of rainfall)

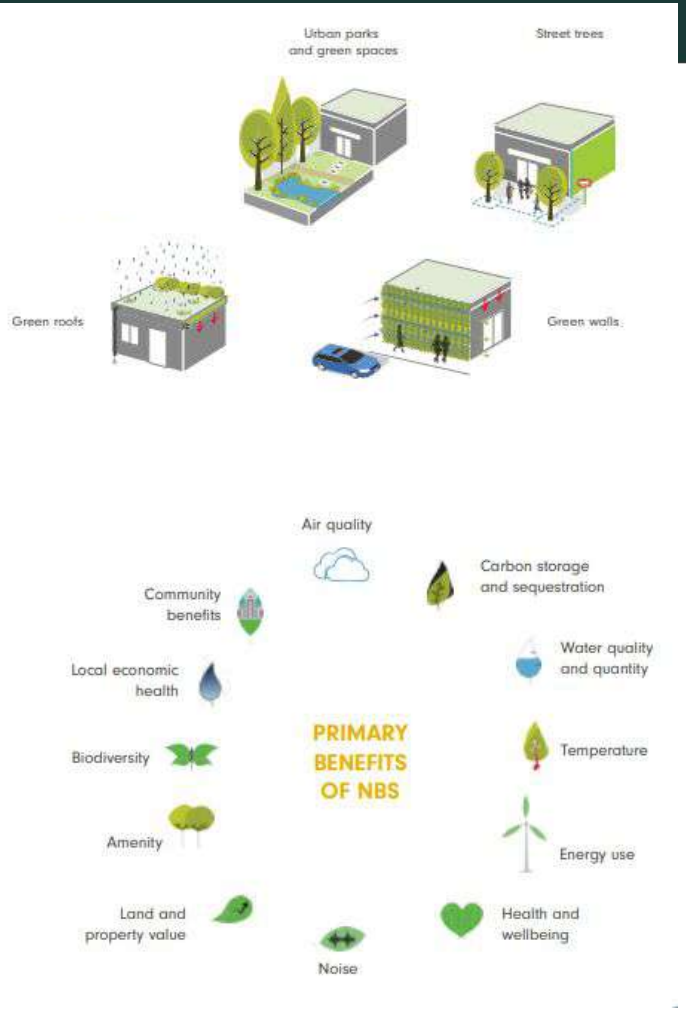
when …

Coverage

Response

Response measures, prioritisation, sequencing, and cost to inform meaningful size and timing of insurance pay-out.

to …

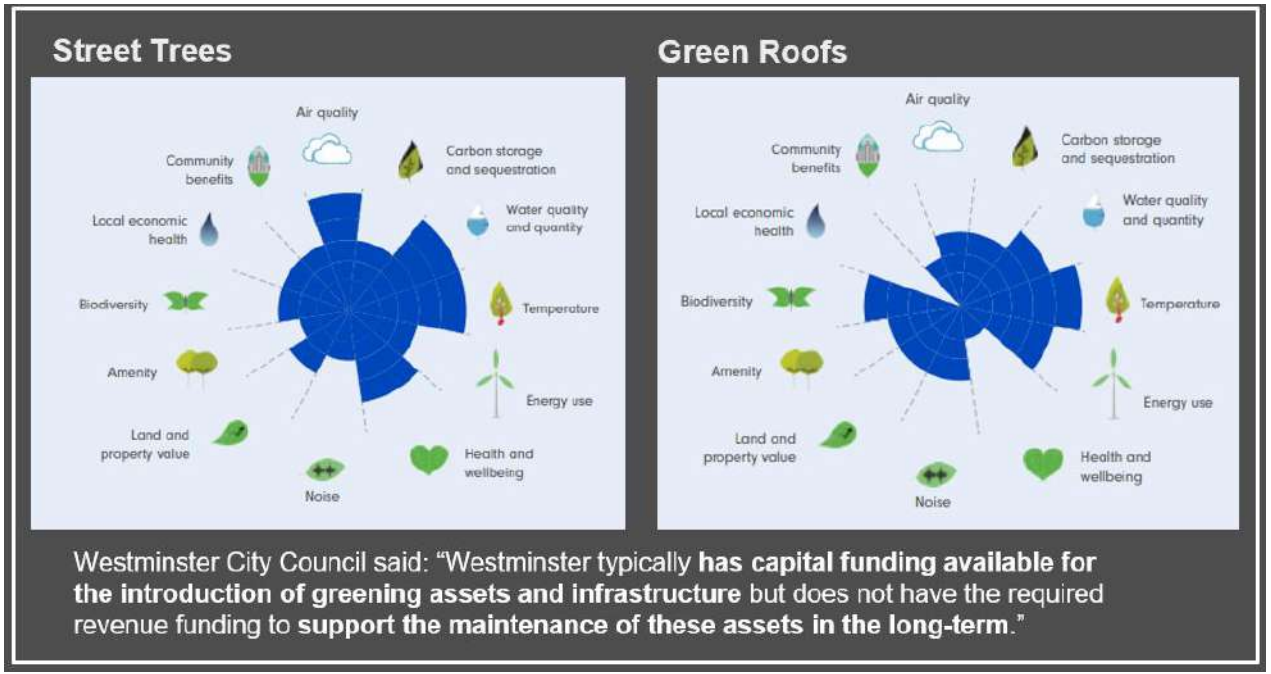


Section 2b: Investment into Nature Based Solutions

Nature-based Solutions (NbS) in Urban Areas

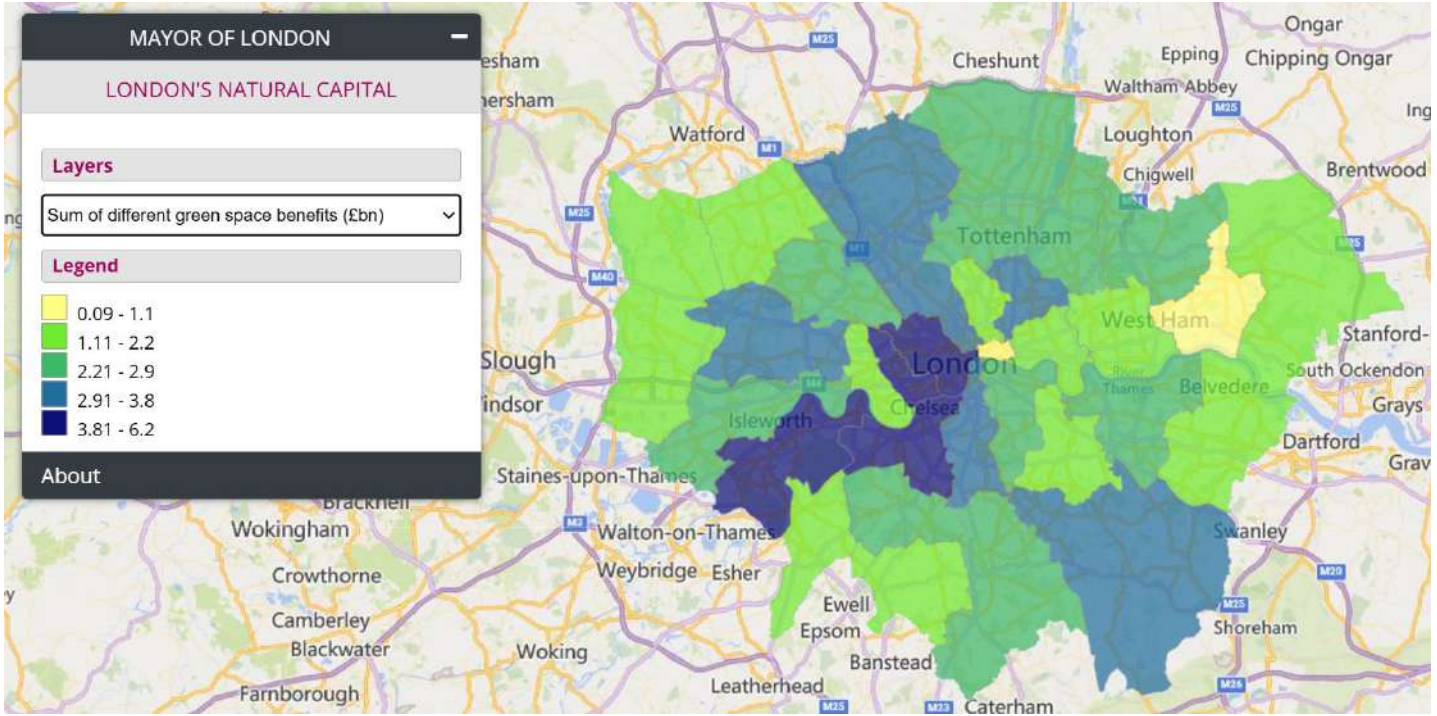
The benefits of NbS in urban areas are well understood, particularly with regards to reducing the **Urban Heat Island Effect.**

NbS' ability to **reduce the hazard** is also at risk from heatwaves



How can we **increase and encourage financing** to (i) implement NbS and (ii) maintain existing NbS?

Nature-based Solutions (NbS) Tools could be useful for financing



Potential funding sources and instruments for NbS

Sources

Public and philanthropic (e.g. governments, foundations, NGOs)

Private funding (e.g. commercial banks, investors, private sector beneficiaries like shops)

Blended finance
UK Municipal Bonds Agency
The Green Finance Fund (though not initially)

Funding Instrument Type

Grant based

Debt based (e.g Green Bonds, Environmental Impact Bonds, Blue Bonds, Community Municipal Investments (CMIs))

Equity based (e.g., private equity or public equity)

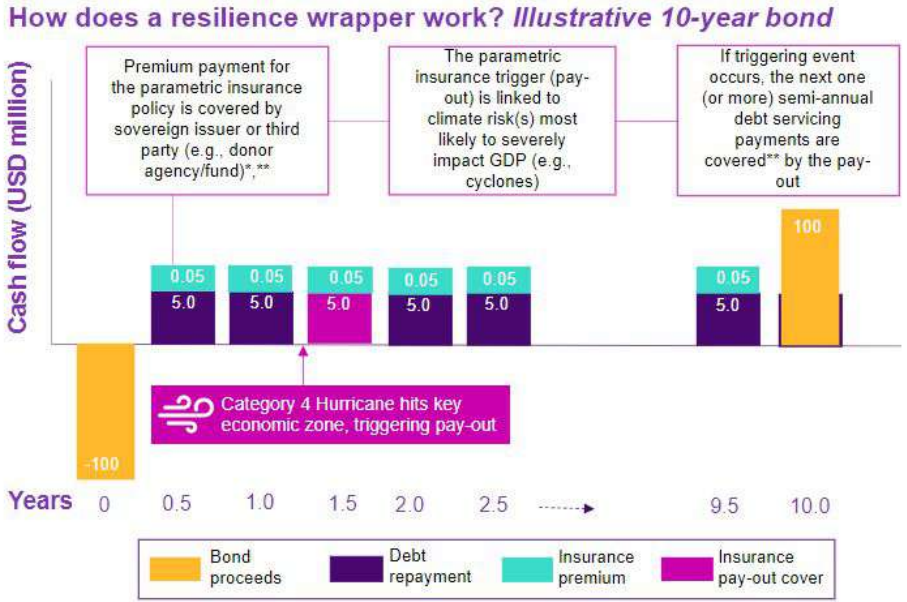
Loan based (e.g. Green Loans like GLA Green Finance Fund)

Special Purpose Vehicle (SPV)

Can you see an application of any of these instruments to overcome current financing barriers?

Can disaster risk financing instruments be linked to investment in NbS?

There is **no clear on a link** at this stage, though the feasibility of “a resilience wrapper” could be explored in a similar way to the **Belize Resilience Wrapper**



A **‘green bond’** issued by a municipality for NbS activities (e.g. investment in new NbS and maintenance of existing) could be **“wrapped”** using an **appropriate trigger for heatwaves**, so that **emergency response activities do not disrupt NbS investment.**

Financing sources/instruments for managing urban heatwaves and investing into NbS

Source: Pathways2Resilience. Available from: https://www.pathways2resilience.eu/financing-regional-adaptation/