# Health Impacts of Climate Change at the Local and Organisational level

Alistair Hunt
Department of Economics,
University of Bath, UK

Impacts World, PIK, Potsdam
October 12th 2017

# Presentation Outline

- Context of Study – Bristol Health Partnership, UK

- Climate Risks
  - Overview
  - Detailed analysis
    - Costing impacts
    - Assessing Vulnerabilities

- Next steps
  - Decision Support for Adaptation

# Context – Bristol Health Partnership


**Bristol** (popn = 450,000)

- 82% of people in good health
- Health and wellbeing inequalities across city
- Life expectancy: persistent gap between most and least deprived areas (gap of 8.9 years for men; 6.6 years for women).

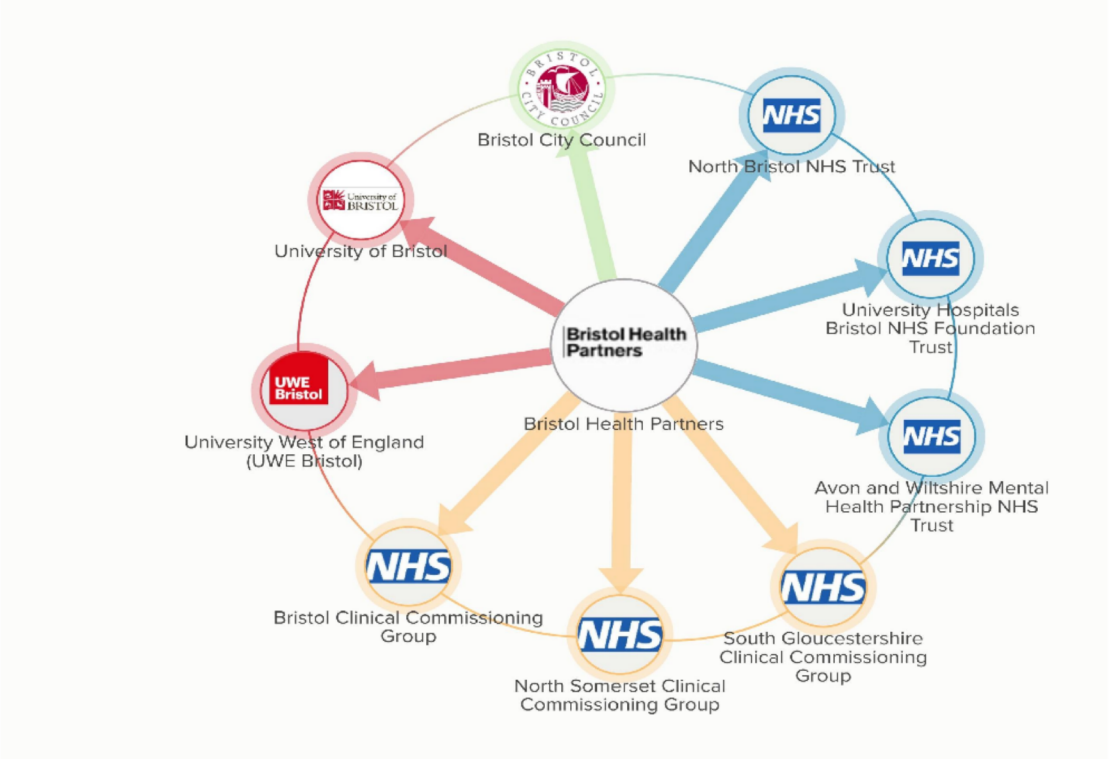
# Context – Bristol Health Partnership

**BHP: strategic collaboration**

- three NHS trusts,
- three clinical commissioning groups,
- two universities,
- local authority

**Interest in climate change due to**:

- Public health risks → demand for treatment
- Risks to services & workforce




**Information on changing climate risks at the city level useful in**

a) raising awareness at board level to feed into strategic investment decisions, and
b) supporting negotiations with strategic health authorities and the Department of Health.

# BHP – Climate change risks: Overview

| | | | | | | |
|---|---|---|---|---|---|---|
| **Population Health:** | | | | | | |
| Temperature | | | | | | |
| | Heat | | | | | |
| | Cold | | | | | |
| Air pollution (e.g. ozone) | | | | | | |
| Indoor Environment | | | | | | |
| | Overheating | | | | | |
| | Air quality | | | | | |
| | Flood damage | | | | | |
| | Water Contamination | | | | | |
| | Allergens | | | | | |
| | Infections | | | | | |
| Ultra-violet radiation | | | | | | |
| Flooding | | | | | | |
| Vector-borne disease (e.g. ticks, mosquitoes) | | | | | | |
| Water and food-borne diseases | | | | | | |
| Health co-benefits | | | | | | |
| **Infrastructure:** | | | | | | |
| Flooding | | | | | | |
| | Properties | | | | | |
| | Transport network (e.g. staff, ambulance) | | | | | |
| | Sewage treatment works | | | | | |
| | Electricity sub-stations | | | | | |
| Drought | | | | | | |
| | Water restrictions | | | | | |
| | Rising cost of water | | | | | |
| Overheating | | | | | | |
| | Properties | | | | | |
| | Offices | | | | | |
| **Other:** | | | | | | |
| Spikes during peak demand | | | | | | |
| Supply chains (medical equipment, saline water) | | | | | | |

| **Key - Level of Concern** | |
|---|---|
| High | |
| Medium | |
| Low | |
| Unknown | |

**Prioritisation process for quantitative analysis**

1. Stakeholder workshop to identify potential risks
2. Presentation of identified risks to key BHP staff
3. Ranking of risks by staff
4. Selection for detailed analysis based on ranking and data availability

→ Flooding; Heat; Electricity Spikes

# Methodology for quantitative analysis

| | | | | |
|---|---|---|---|---|
| No. of properties currently at flood risk. E.g. 1:20, 1:50, 1.100 year (historic probs.) | X | Cost of flooding: Unit values. E.g. property damage | = | A: Value of Baseline Risk - historic |
| No. of properties at flood risk. E.g. 1:20, 1:50, 1.100 year (historic probs.) Future periods with devt./socio-ec change | X | Cost of flooding: Unit values. E.g. property damage | = | B: Value of Baseline Risk – future, e.g. 2020, 2030, etc |
| No. of properties at flood risk. E.g. 1:20, 1:50, 1.100 year (probs. in future periods with climate change) | X | Cost of flooding: Unit values. E.g. property damage | = | C: Value of Risk with climate change – future periods |

Gross impact cost = C;
Net climate change impact cost = C - B

**Data Sources:**

Climate Projections: UKCP09; L(10), M(50), H(90).

Climate-Health relationships: Derived from UK Climate Change Risk Assessment

Exposure: Bristol Council GIS data

Monetary values: Defra (2008), inter alia

# Results: Flooding

Public Health: Economic Costs from flooding in Bristol, 2016 - 2040 Medium scenario (£ million)

| | 1 in 30 year | 1 in 100 year | 1 in 1000 year |
|---|---|---|---|
| **Injuries (non-fatal) annual** | 13.9 | 6.5 | 0.7 |
| **Injuries (fatal) annual** | 30.9 | 14.4 | 1.6 |
| **Mental (stress) annual** | 0.7 | 0.3 | 37.8 |
| **Total Health annual** | 45.6 | 21.2 | 2.3 |
| **Total expected annual cost £** | | 114.1 | |
| **Total expected cost to 2040 £** | | 2,853 | |

UNIVERSITY OF BATH

# Results: Flooding

- Flood risks: 1) river, 2) coastal and 3) surface water

- Costs: 1) non-fatal, 2) fatal and 3) mental stress
  - **Treatment costs ≈ 30%**
  - **Cost of lost productivity ≈ 20%**
  - Pain & Suffering ≈50%

- Estimated BHP costs = £35 million p.a. or £600 million by 2040

40% increase with climate change

UNIVERSITY OF BATH

## Number of health establishments flooded by ward in 2040

| Bristol Ward | 1 in 30 yr | 1 in 100 yr | 1 in 1000 yr |
|---|---|---|---|
| Ashley | 2 | 2 | 2 |
| **Avonmouth** | **4** | **4** | **4** |
| Bedminster | 1 | 1 | 1 |
| Bishopston | 0 | 0 | 0 |
| Bishopsworth | 0 | 0 | 0 |
| Brislington East | 1 | 2 | 2 |
| Brislington West | 1 | 3 | 3 |
| **Cabot** | **2** | **4** | **5** |
| Clifton | 1 | 2 | 2 |
| Clifton East | 1 | 1 | 1 |
| Cotham | 0 | 0 | 0 |
| Easton | 1 | 1 | 2 |
| Eastville | 0 | 0 | 0 |
| Filwood | 0 | 0 | 0 |
| Frome Vale | 0 | 2 | 2 |
| Hartcliffe | 0 | 0 | 0 |
| Henbury | 0 | 2 | 2 |
| Hengrove | 2 | 2 | 2 |
| Henleaze | 0 | 1 | 1 |
| Hillfields | 1 | 1 | 2 |
| **Horfield** | **4** | **4** | **4** |
| Kingsweston | 0 | 0 | 1 |
| Knowle | 1 | 1 | 1 |
| Lawrence Hill | 0 | 1 | 1 |
| Lockleaze | 1 | 1 | 1 |
| Redland | 0 | 0 | 0 |
| **Southmead** | **4** | **5** | **7** |
| **Southville** | **5** | **6** | **5** |
| St George East | 0 | 0 | 0 |
| St George West | 1 | 1 | 1 |
| Stockwood | 0 | 0 | 0 |
| Stoke Bishop | 1 | 1 | 1 |
| Westbury-on-Trym | 0 | 1 | 1 |
| Whitchurch Park | 0 | 0 | 0 |
| Windmill Hill | 0 | 0 | 0 |

## Costs to Health Buildings from flooding in Bristol, 2040 Medium scenario, (£ million)

| Impact Costs | 1 in 30 year | 1 in 100 year | 1 in 1000 year |
|---|---|---|---|
| Building & Contents damage | 0.07 | 0.04 | 0.004 |
| Total expected annual cost £ | | 0.2 | |
| Total expected cost to 2040 £ | | 4.9 | |

£3.2m without climate change

# Results: Overheating

**Public Health: Economic Costs from overheating in Bristol, 2016 - 2040 (£ million)**

| Climate scenario | Low | Medium | High |
|---|---|---|---|
| **Mortality (no. of people)** | 10 | 20 | 45 |
| **Morbidity (no. of people)** | 980 | 2050 | 4600 |
| **Mortality (fatal) £ million** | 15 | 30 | 70 |
| **Morbidity (non-fatal) £ million** | 0.6 | 1.2 | 2.8 |
| **Total expected annual cost £ million** | 16 | 33 | 75 |
| **Total expected cost to 2040 £ million** | 400 | 800 | 1800 |

UNIVERSITY OF BATH

# Results: Overheating

- Respiratory and cardio-vascular impacts
- All mortality costs and majority of morbidity costs 'non-financial'

Estimated BHP costs = 5% of total:

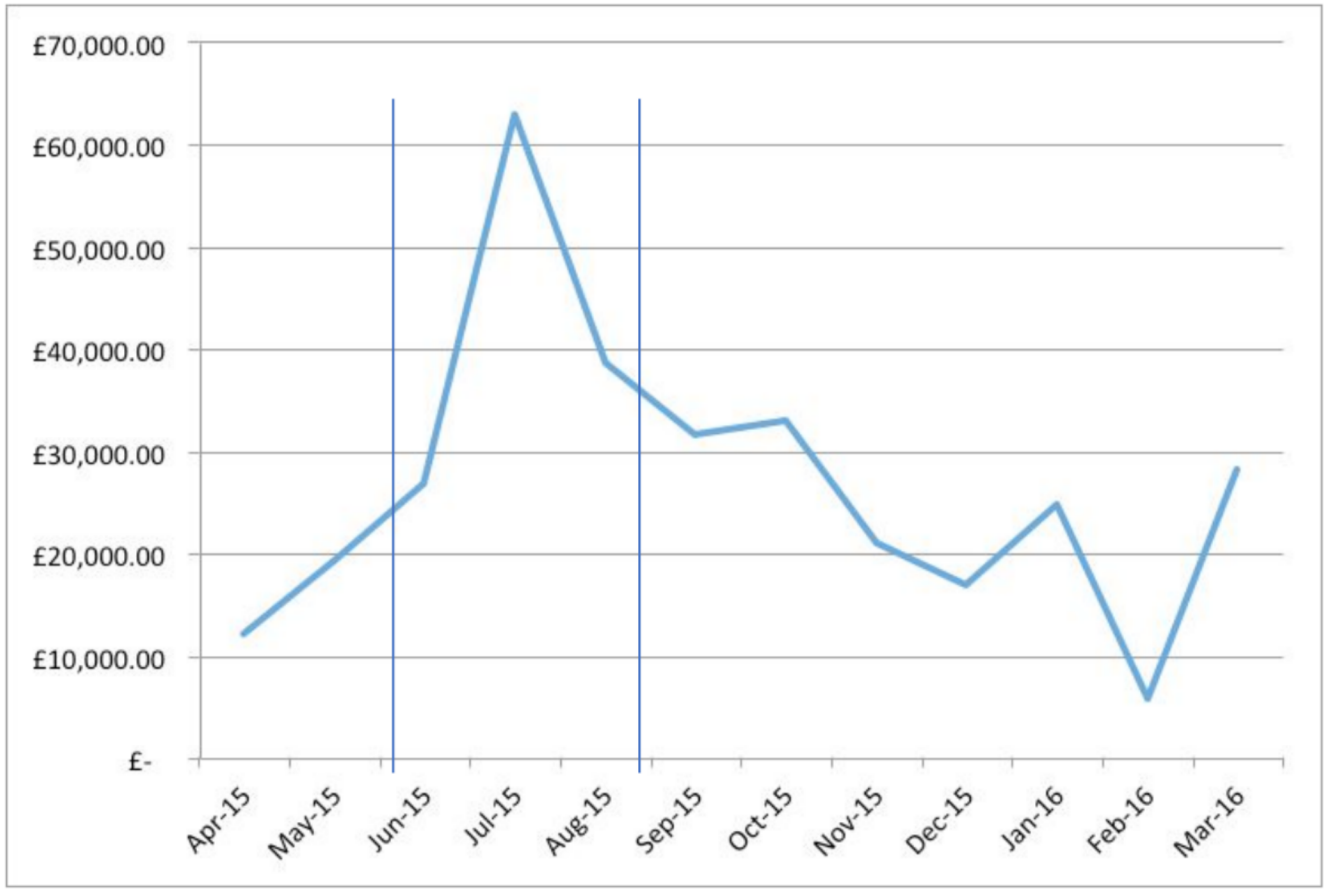
- **<u>Annual:</u> c. £800,000 (low) / £1.8 million (med) / £3.8 million (high) p.a.**
- **<u>Cumulative:</u> c. £20 million (low) / £40 million (med) / £90 million (high)**

- **+ risk to reputation?**

UNIVERSITY OF BATH

# Summer cooling of Bristol Royal Infirmary

## + £38,000 p.a. to 2040 (12% increase) from climate change




UNIVERSITY OF BATH

# Who is at most risk from climate risks?

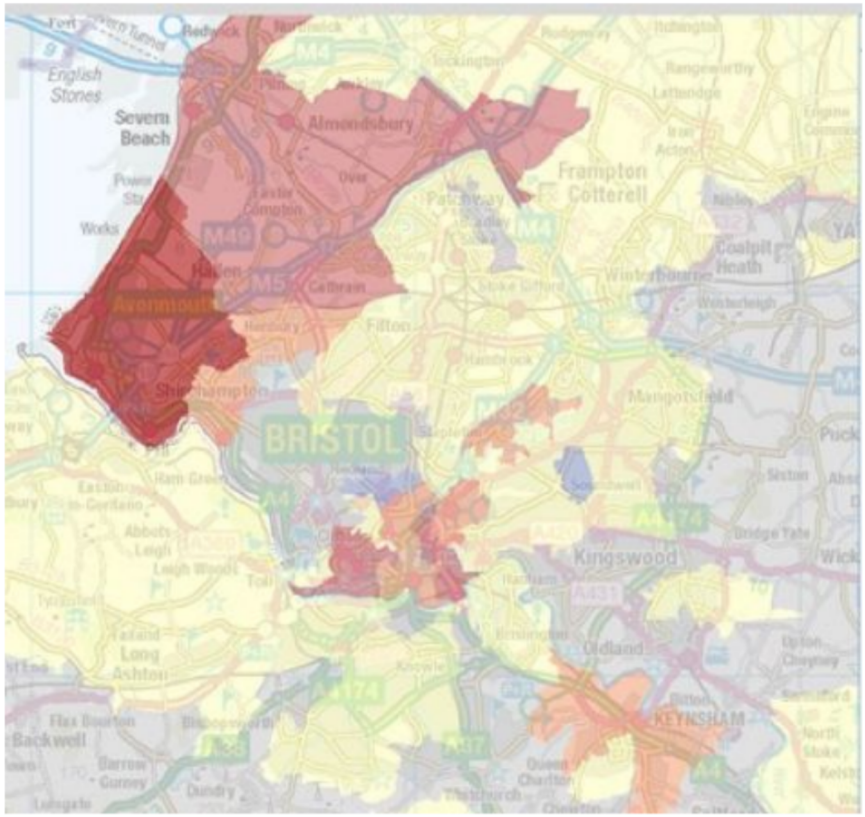
- Social vulnerability – how well people able to cope with/respond to events like floods and heat-waves

- Drivers of vulnerability
  - Personal features of individual, e.g. age & health, affects sensitivity to climate impacts;
  - Environmental characteristics, e.g. availability of green space, quality of housing stock or elevation of buildings
  - Social and institutional context, e.g. strength of social networks, the cohesion of neighbourhoods which affect people's ability to adapt.

UNIVERSITY OF BATH

# Flooding vulnerabilities

Index of flood-related social vulnerability **combined** with potential for exposure to flooding from rivers and sea



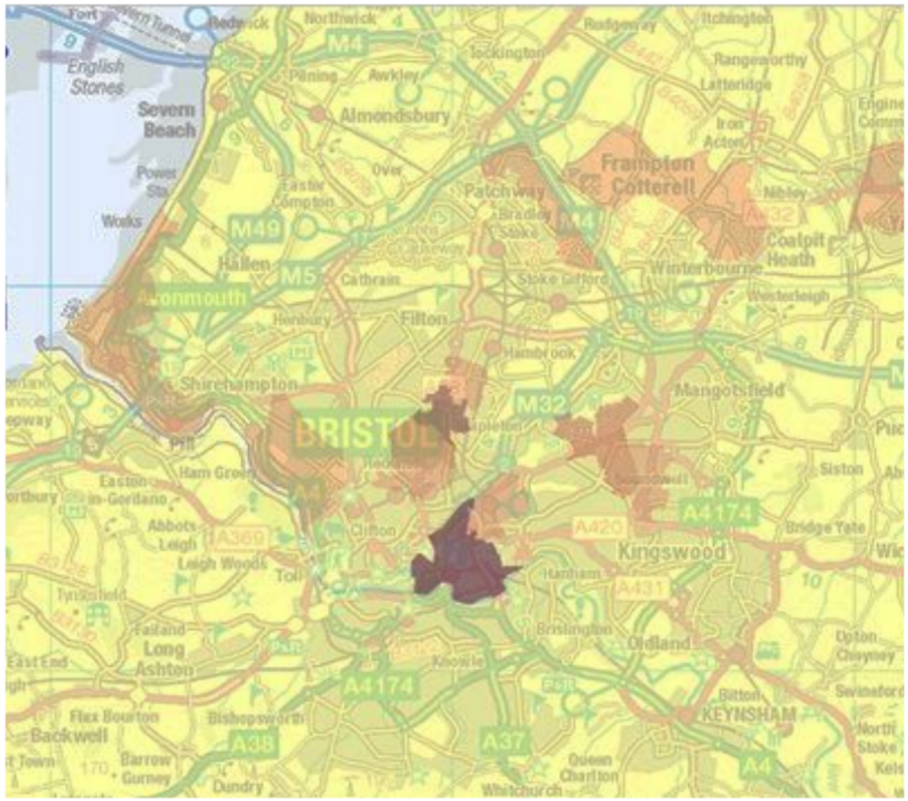


UNIVERSITY OF BATH

(Source: climatejust.org.uk)

# Heat vulnerabilities

Index of heat-related social vulnerability **combined** with potential for exposure to heat





Two areas in Bristol identified as acutely vulnerable to heat because of physical environment - correspond with percentage of high rise homes

(Source: ClimateJust.org.uk)

# PRESCRIPTION

## (for prevention)

Bristol Health Partners

UNIVERSITY OF BATH

# Systemic action on three levels

**ORGANISATIONAL**

1. **Expand cross-departmental forum** for climate risk with Exec Director Leadership
2. **Factor** climate change **in** to **risk management** and **emergency planning**
3. **But…need clear cost-benefit** to action change within 1-5 year planning periods

**CITY**

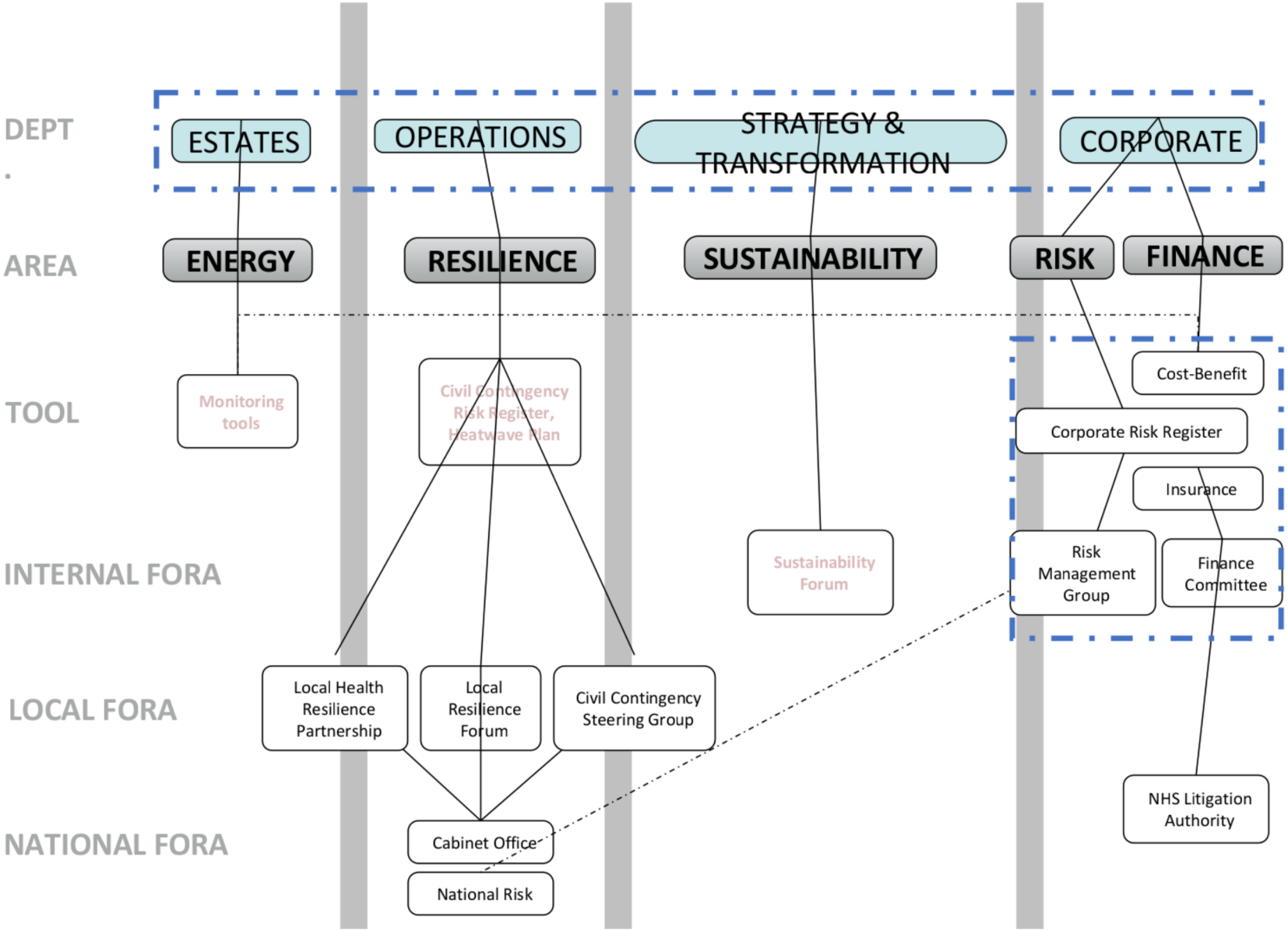
1. **Cross-organisational forum** for climate risk with Exec Board Leadership
2. **Understand 'attribution' (i.e. who pays what?)**
3. **Detailed risk assessment (inc. interdependence + quantification)**

**NATIONAL**

Engage with Government and National Agencies on, e.g.:

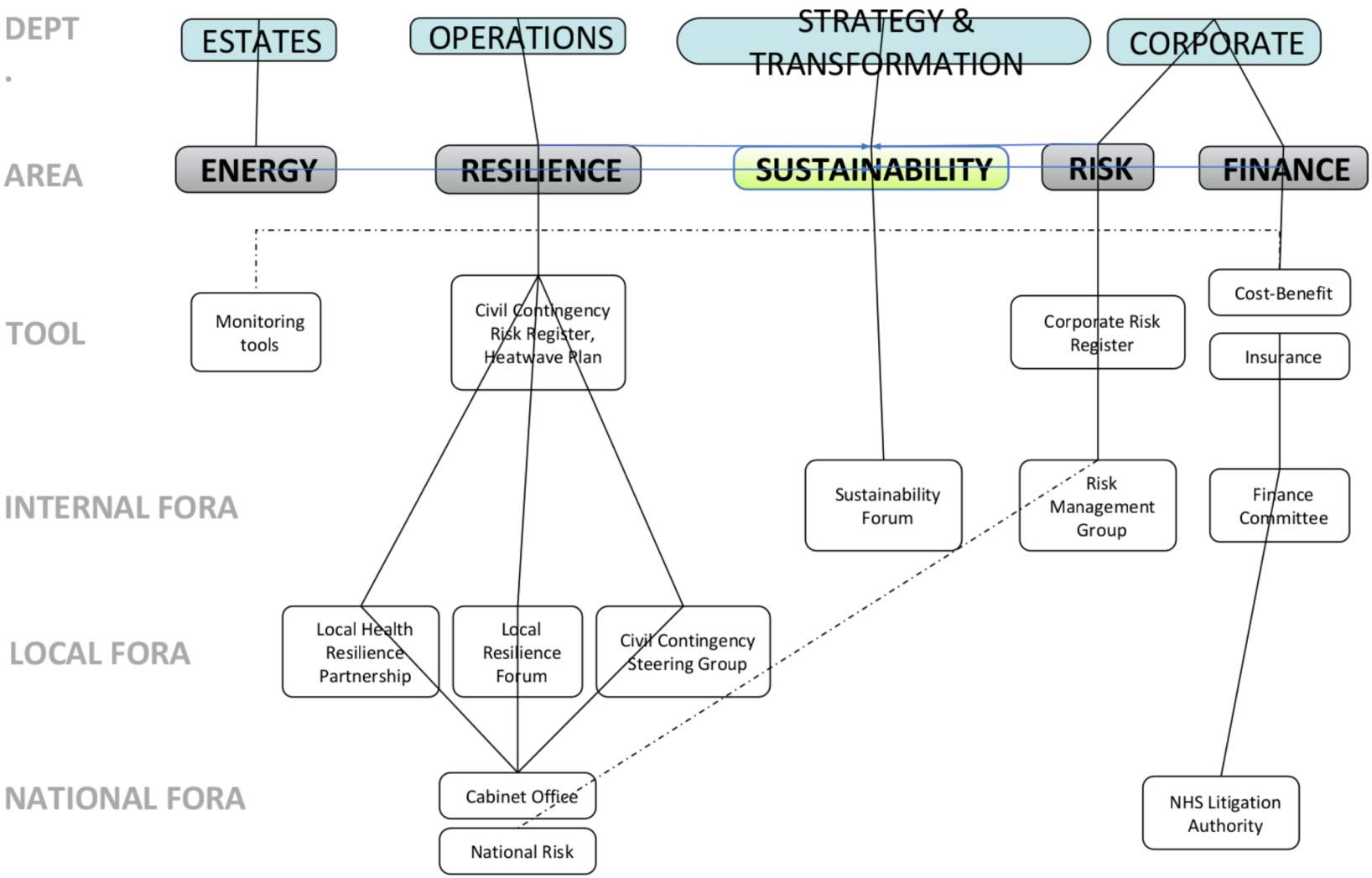
- **National Formula**
- NHS **Litigation** Authority
- **Supply Chain** (ISO Standards)

## ORGANISATIONAL LEVEL: Current action marginal, not comprehensive



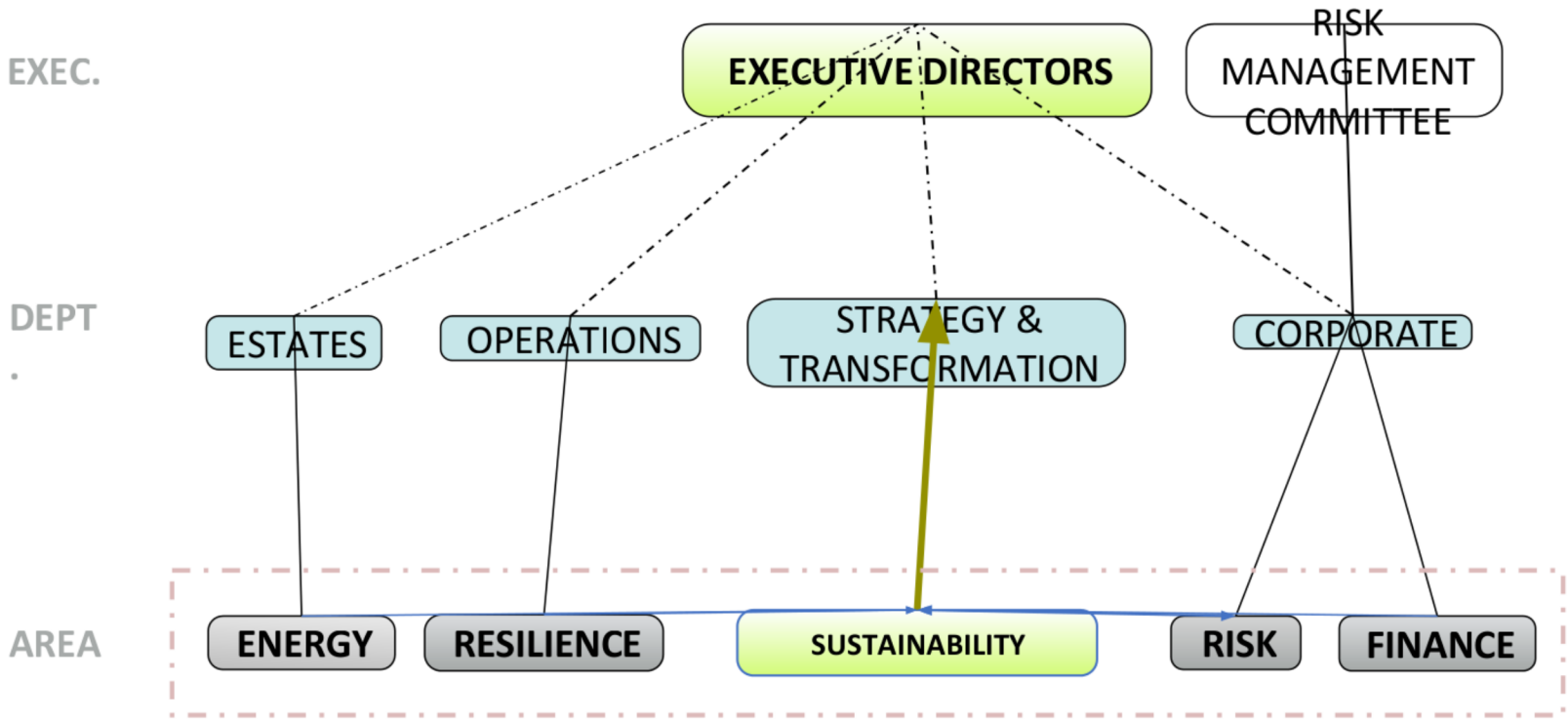
ORGANISATIONAL LEVEL:

## Mapping cross-departmental responsibility for climate risk



**ORGANISATIONAL** LEVEL:

## RECOMMENDATION: Expand Sustainability Forum



# Conclusions/Reflections

- Growing appetite for organisational level analysis of climate impacts to inform both operational and strategic decisions

- Quantitative analysis of climate impacts possible, given sufficient data and modelling capabilities

- Resource- and politically constrained organisations lack motivation to consider longer-term risks

→ as informing community, we may need to emphasise observed trends & events as well as future projections

UNIVERSITY OF BATH