



# Prevention of **extreme weather** impacts on **Bristol's health** services

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# PROJECT PARTNERS

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GIS Specialist, Bristol City Council

# THANK YOU

**Bristol Health  
Partners**

University Hospitals Bristol   
NHS Foundation Trust

North Bristol   
NHS Trust

  
*Bristol Clinical Commissioning Group*



 **Sustainable  
Development Unit**



**Public Health  
England**

**Bill Gething**  
Sustainability + Architecture



Health White Paper + Marmot Review

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“..**climate change** is one of the **biggest public health threats** of the **21st century**”

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National Health Care = £171 billion  
(23% of Total Public Spending)





**BANK OF ENGLAND**

**2015**

***“Climate change  
could become one of  
the biggest risks to  
economic stability”***

Mark Carney  
**Governor of the Bank of England**  
September 2015



- **Relatively minor impact on PCT property...**
- ...curtail non-emergency services for around 10 days.
- 1,246 operations and c 8,000 outpatient appointments cancelled
- **£3.8m to mitigate this loss of income**



# GLOUCESTERSHIRE

2007





# CUMBRIA

# 2015





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# Storm Desmond: Schools, hospitals and transport disrupted by flooding

🕒 14 minutes ago | [UK](#)



- Cumbria Partnership NHS Foundation Trust – **only running essential services**
- Cumberland Infirmary in Carlisle - **powered by back-up generator**
- **No trains** between England and Scotland via Preston - **road restrictions**
- Association of British Insurers - “**a small army**” of claims managers
- **All but emergency operations cancelled** at the Royal Lancaster Infirmary







**United Nations**  
Framework Convention on  
Climate Change

**2015**



**PARIS2015**  
UN CLIMATE CHANGE CONFERENCE  
COP21•CMP11





***“...making the business case for climate change adaptation is essential...”***

*...Unless clients can see the financial benefits of investing in adaptation - as well as the potential costs of not adapting - they will be unwilling to spend money now on adapting for risks which are not certain or clear.*

***”***



Modern Built Environment Knowledge Transfer Network  
(MBEKTN)

*(From 2013 Survey prepared for the Environment Agency)*



“...the strongest cross-cutting finding is the  
**lack of engagement of economic actors** in  
the design and implementation of urban  
responses to climate change.”



Alexander Aylett  
Banting Postdoctoral Fellow in Urban Climate Change Governance  
Massachusetts Institute of Technology

*(From 2014 Global Survey in partnership with ICLEI)*





# Companies urged to realise true cost of extreme weather

27 November 2014, source [edie newsroom](#)

Public and private sector organisations are being advised to report their maximum probable annual losses caused by extreme weather, compared with their current assets and operations.

The recommendations come from the latest Royal Society report - Resilience to extreme weather - which encourages all capital owners to realise the value of adapting to extreme events.



The Royal Society encourages all capital owners to realise the value of adapting to extreme events

# IDENTIFYING VULNERABILITIES



- Flooding
- Overheating
- Peak demand disruption?
- Supply chain disruption?

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)						

# interdependency models from risk analysis

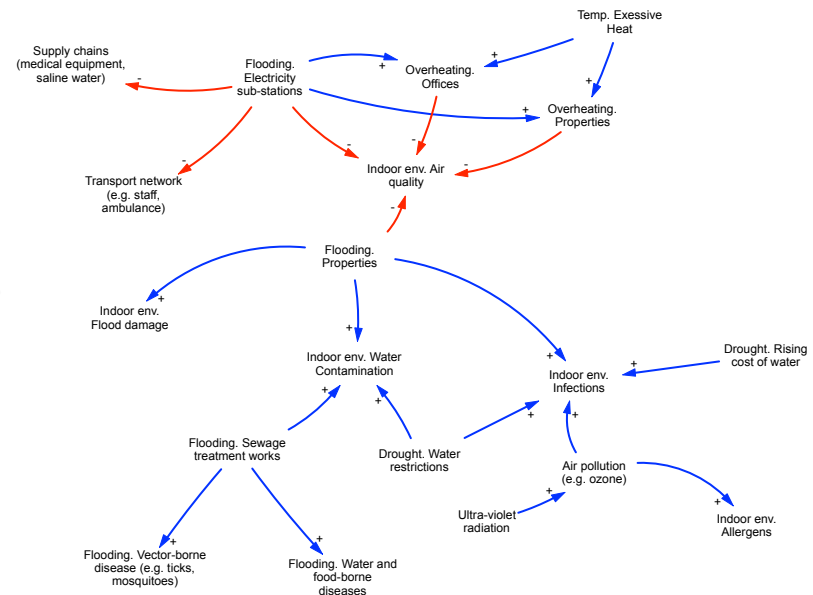
Investigation	Infrastructure	Impact	Source of data
Overheating	Properties	Population	?
Flooding	Properties	Population	BCC Flood Team
Flooding	Transport network	Population	BCC Flood/Transport Teams
Drought	All Bristol	Population	Estates + Water Cos
Overheating	University Estate	Staff/patient	Estates

INVESTIGATION REVEALING  
DATA AVAILABILITY

Event	Infrastructure	Impact	Source of data
1 Overheating	Properties	Population	?
2 Flooding	Properties	Population	BCC Flood Team
3 Flooding	Transport network	Population	BCC Flood/Transport Teams
4 Drought	All Bristol	Population	Estates + Water Cos
5 Overheating	University Estate	Staff/patient	Estates



Investigation	Infrastructure	Impact	Source of data
Overheating	Properties	Population	?
Flooding	Properties	Population	BCC Flood Team
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Overheating	University Estate	Staff/patient	Estates





# Identified risks + **findings**

Beyond main/known infrastructures (e.g. energy, transport, IT, supplies), e.g.

- **Funding**, staff (e.g. **authorisation**)
- **Fuel** (ambulance, 4x4s, etc.)
- Policy/protocols, **governance** (i.e. what do do if...)
- Specialist or otherwise **irreplaceable staff**
- IT
- Staff shortages (young professionals - **schools**; older professionals - **care homes**)
- **Pharmacies** (esp. their lack of preparedness in this area)
- Mass repatriation costs for large events?
- **Cumulation** of impacts

**But...**need to understand **scale of impact** in each area...



# Data Sourcing

## Population

- Instant Atlas data hub
- Census data, Ward stats, deprivation, health and wellbeing
- State of the City Report Projected pop change by 2037
- Identification of vulnerable population, elderly, young

## Over Heating

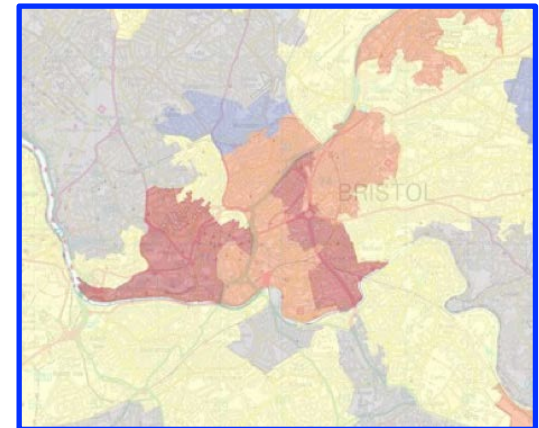
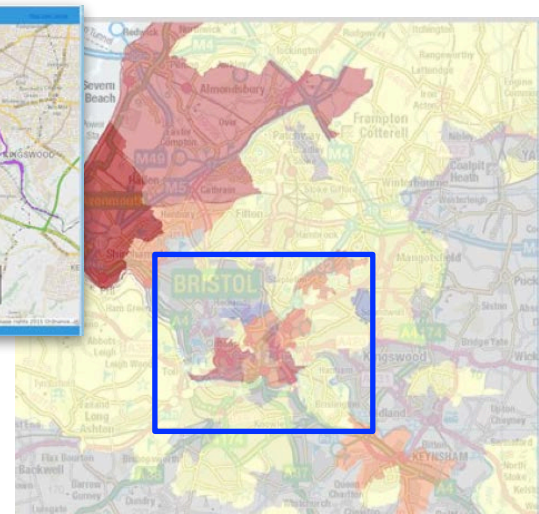
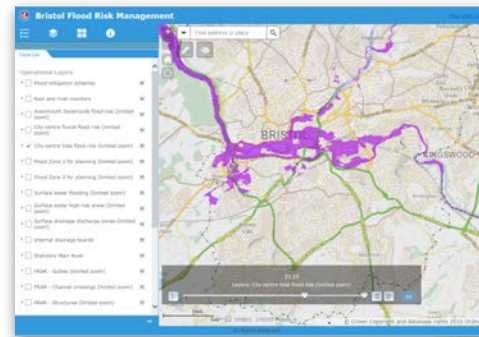
- Building Height
- Orientation
- Climate Just data - climate and social deprivation

## Flood Risk

- Web map highlighting flood risk areas
- Fluvial, Surface, Tidal events
- Current risk, 1 in 30yrs, 1 in 100yrs, 1 in 1000yrs events

## Infrastructure

- Health properties GP, Health Centres, Hospitals, Care Homes
- BCC Housing Stock, build type, no. floors, age
- Sub Stations



Risk level	High (1/30yr)	Med (1/100yr)	Low (1/1000yr)
Total properties	16300	26000	29000
Residential properties	16000	22300	24500
Residential population	37600	52400	58600
Non-residential properties	300	3700	4200



HealthGIS



South, Central and West  
Commissioning Support Unit

# Breaking points:

## No. times on 'Black Alert' 2012-16

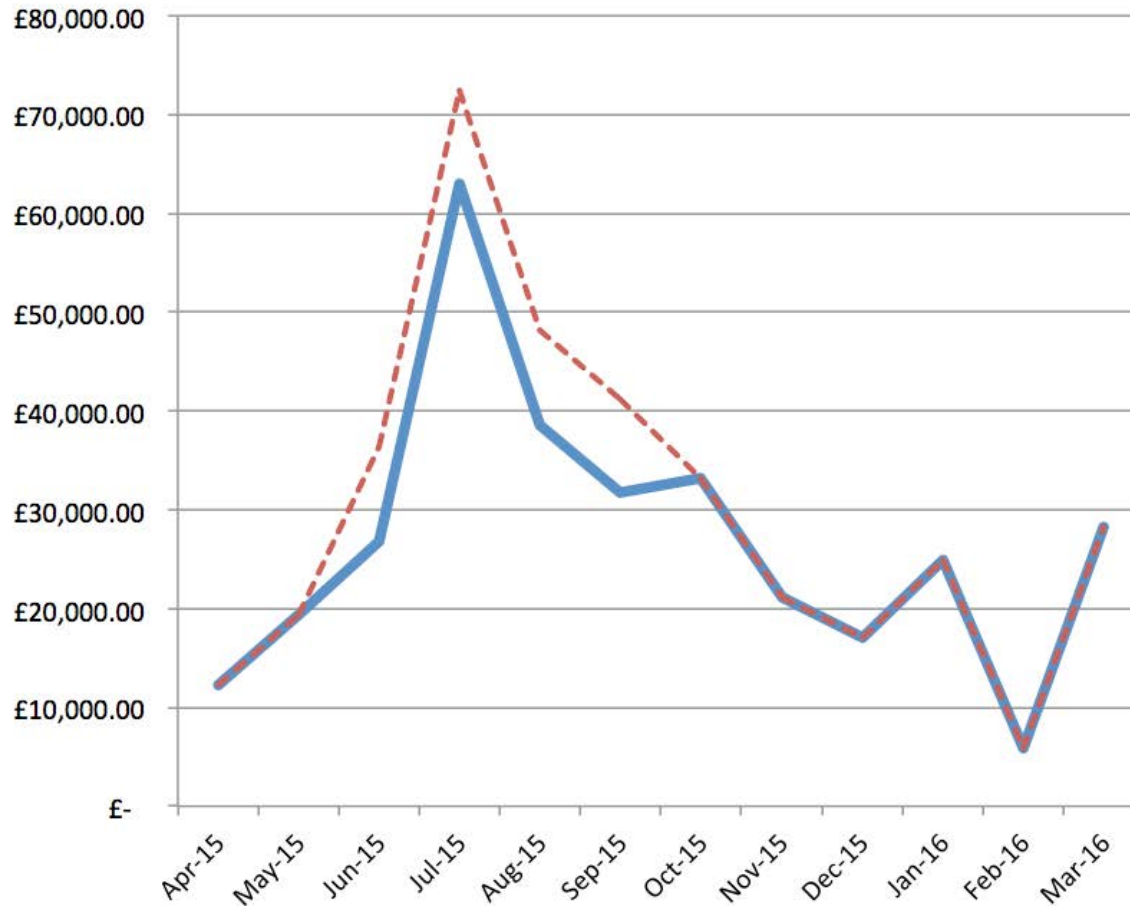
- **Children services** particularly between **Nov-Feb**
- UHB is **tertiary care provider for paediatrics**
- **Adult spikes** less extreme seasonally
- **Escalation plan**

	Bristol Children's Hospital	Bristol Royal Infirmary (April 2013-May 2016)
2012	1	unknown
2013	2	46
2014	1	16
2015	4	68
2016	4	12



# Summer cooling of BRI Precinct

## 12% increase due to climate change



- Cost of electricity **c.£322,000 p.a.**
- Current **system** reportedly **at limit**
- 100 portable air-conditioning units (**weekly hire cost c.£8,300**)
- 12% increase: c. £1m by 2040

# Health establishments flooded by ward in 2037

## *Total expected costs*

- £3.2 million
- **£4.9 million** (with climate change)



Bristol Ward	1/30yr	1/100yr	1/1000yr
Ashley	2	2	2
<b>Avonmouth</b>	<b>4</b>	<b>4</b>	<b>4</b>
Bedminster	1	1	1
Bishopston	0	0	0
Bishopsworth	0	0	0
Brislington East	1	2	2
Brislington West	1	3	3
<b>Cabot</b>	<b>2</b>	<b>4</b>	<b>5</b>
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
<b>Horfield</b>	<b>4</b>	<b>4</b>	<b>4</b>
Kingsweston	0	0	1
Knowle	1	1	1
Lawrence Hill	0	1	1
Lockleaze	1	1	1
Redland	0	0	0
<b>Southmead</b>	<b>4</b>	<b>5</b>	<b>7</b>
<b>Southville</b>	<b>5</b>	<b>6</b>	<b>5</b>
St George East	0	0	0
St George West	1	1	1
Stockwood	0	0	0
Stoke Bishop	1	1	1
Westbury-on-	0	1	1
Whitchurch Park	0	0	0
Windmill Hill	0	0	0

# Overheating



- Respiratory and cardiovascular impacts
- All *mortality* costs and majority of *morbidity* costs 'non-financial'
- **Estimated BHP costs = 5% of total**

*Costs from overheating in Bristol, 2016 - 2040 (£ millions)*

Climate scenario	Low	Medium	High
<b>Total expected annual cost £ million</b>	16	33	75
<b>Total expected cost to 2040 £ million</b>	400	800	1800

- Annual: **c. £800,000 - £3.8 million** (low-high) **p.a.**
- Cumulative: **c. £20 million - £90 million** (low-high)



# 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 and suffering - 50%*)

*Costs from flooding in Bristol, 2016 - 2040 (£ millions)*

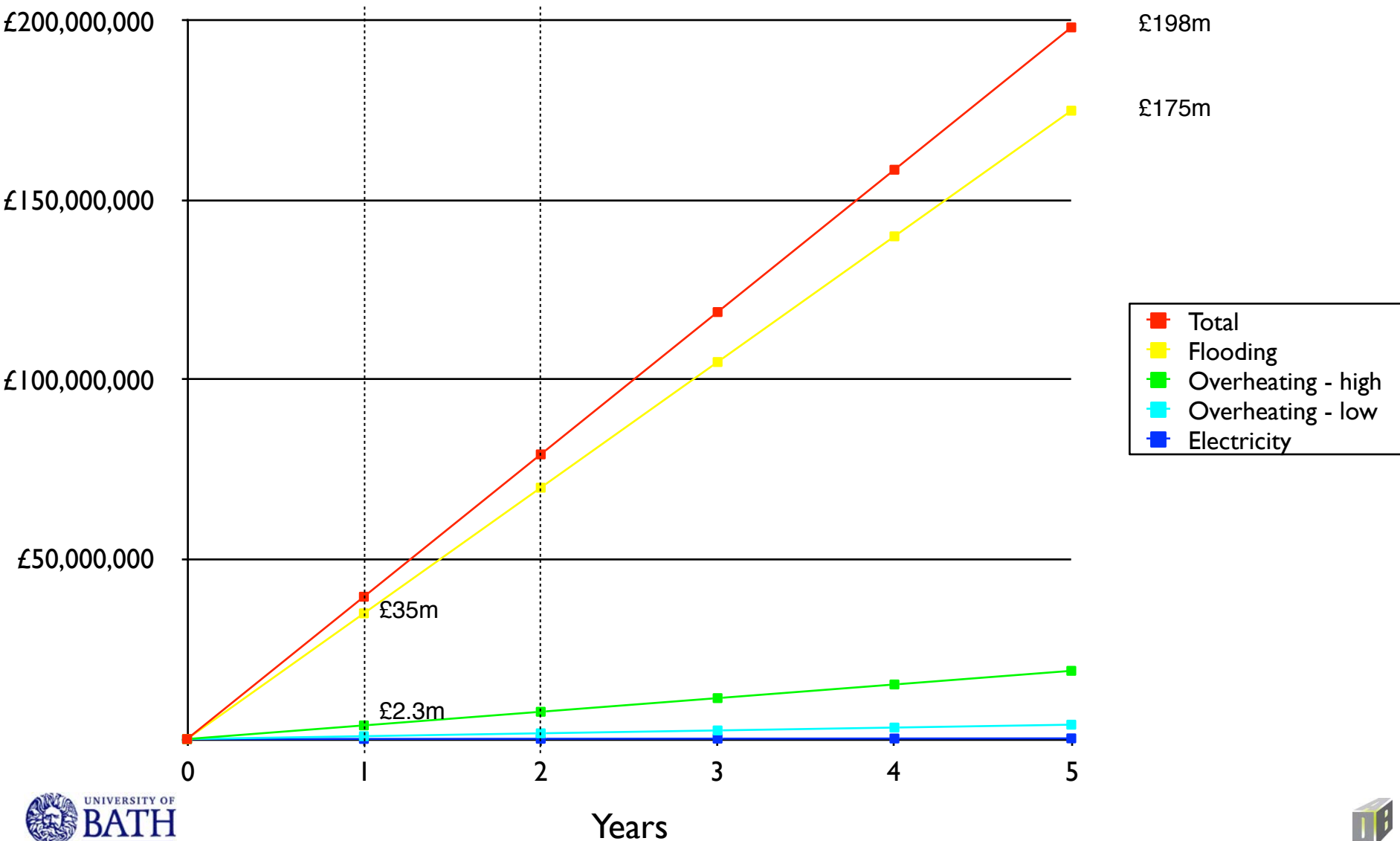
	1 / 30 yr	1 / 100 yr	1 / 1000 yr
<b>Total Health annual</b>	45.6	21.2	2.3
<b>Total expected annual cost £</b>		114.1	
<b>Total expected cost to 2040 £</b>		<b>2,853</b>	

- Annual: **c. £35 million p.a.**
- Cumulative: **c. £600 million** (by 2040)



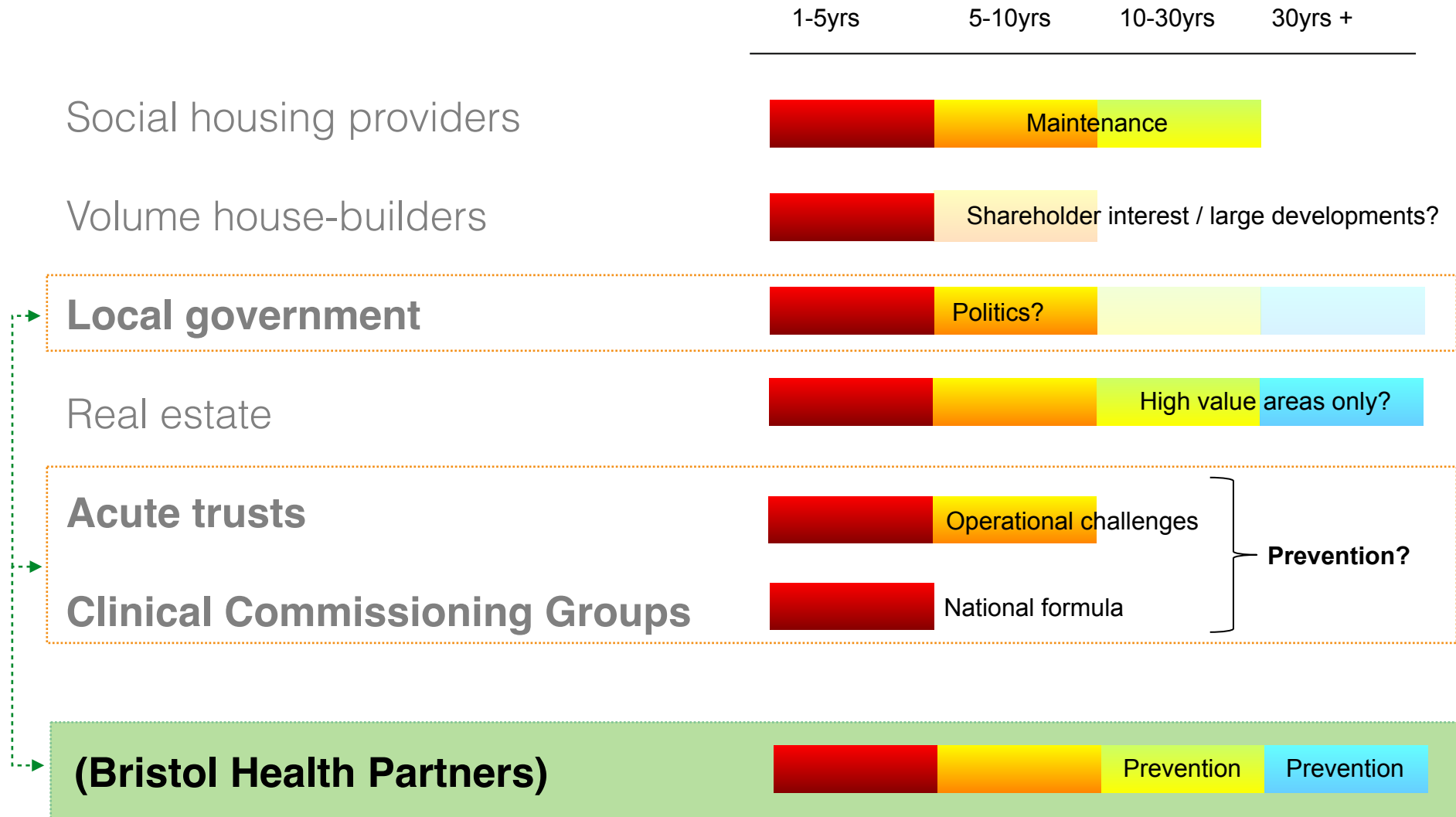
# Linear increase over 5 year period

5 Yr Cumulative





# Health sector needs **space for long-term thinking**



# Climate change is not recognised as a risk

Type	Description
<b>Patient Safety</b>	Risk of <u>harm to patients</u> , includes physical and psychological harm.
<b>Quality</b>	Impact on the <u>quality of our services</u> . Includes complaints and patient experience risks.
<b>Workforce</b>	Risks relating to human resources (not safety), organisational development, staffing levels and competence and training compliance
<b>Statutory</b>	Risks relating to non-compliance of upon on our statutory obligations, regulatory compliance, assessments and inspections
<b>Reputation</b>	Risk to department, service or Trust <u>reputation</u> through adverse publicity
<b>Business</b>	Risks with the potential to impact upon our business or project objectives. Includes <u>service and business interruption</u> .
<b>Finance</b>	Risks relating to <u>financial matters</u> or non achievement of savings schemes targets.
<b>Environment</b>	<u>Risks involving the environment</u> , including chemical spills, pollution, <u>atmosphere</u> or <u>carbon footprint</u> .



## Climate Change Act 2008



United Nations  
Framework Convention on  
Climate Change



PARIS2015  
UN CLIMATE CHANGE CONFERENCE  
COP21•CMP11

## Public Services (Social Value) Act 2012

### 2012 CHAPTER 3

(3) The authority must consider—

(a) how what is proposed to be procured **might improve the economic, social and environmental well-being** of the relevant area, and

(b) how, in conducting the process of procurement, it might act with a view to securing that improvement.

## Civil Contingencies Act 2004

2004 c. 36 ► Part 1 ► Contingency planning ► Section 2

(1) A person or body listed in Part 1 or 2 of Schedule 1 shall—

(a) assess the risk of an emergency occurring,

(b) making it necessary or expedient for the person or body to perform any of his or its functions

(c) maintain plans so that if an emergency occurs...

(i) preventing the emergency

(ii) reducing, controlling or mitigating its effects, or

(iii) taking other action in connection with it...



Public Health  
England

 **Sustainable  
Development Unit**





# Systemic action on three levels

## ORGANISATIONAL



- **Better corporate planning** e.g.:
  - Sustainable/secure quality of care
  - STP/prevention
  - Better risk/emergency management
  - Agenda setting and prioritisation
  - Insurance
- **1-5 yr horizon!**

## CITY



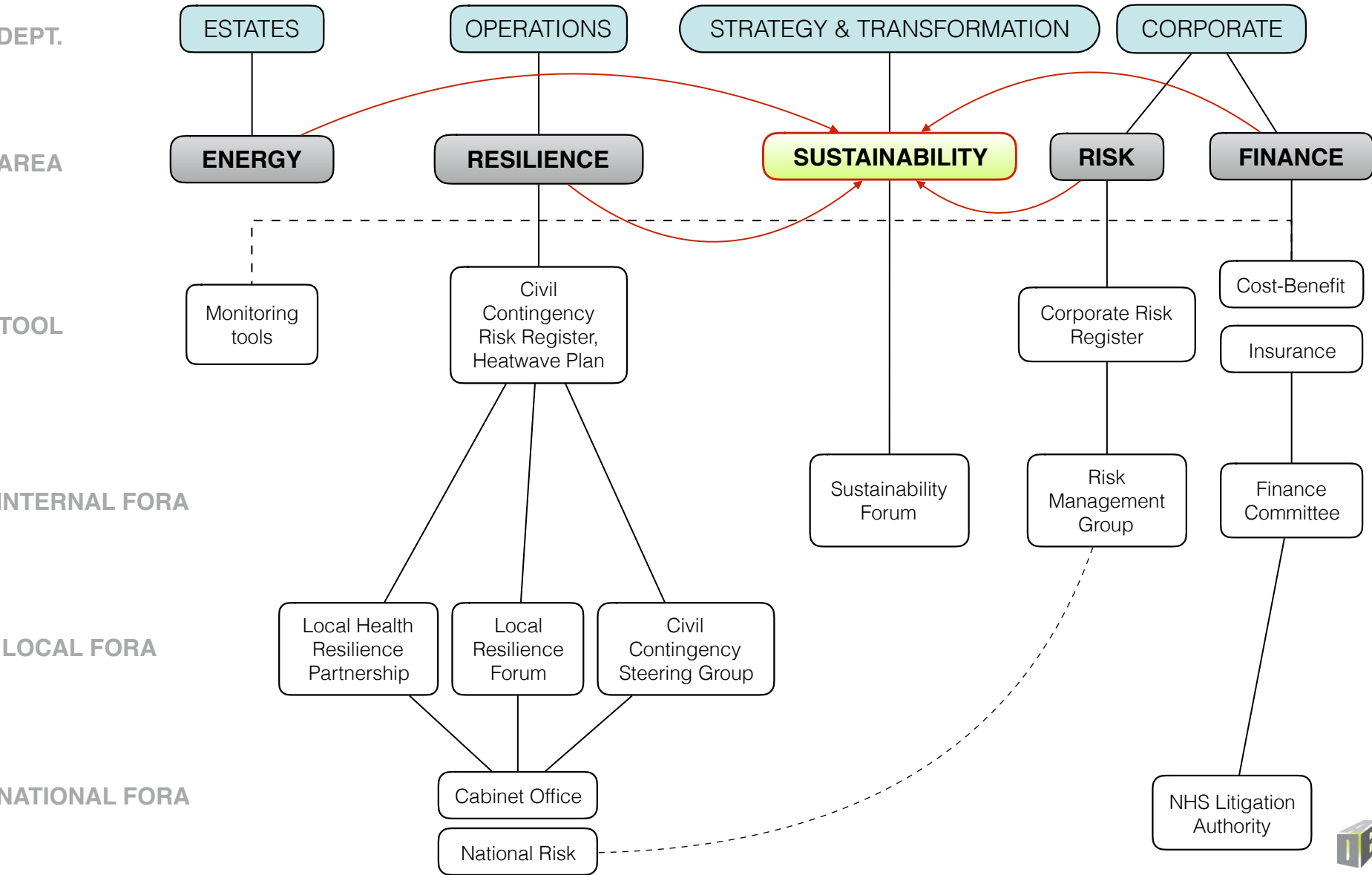
- **Longer-term** planning horizons
- **National leadership** / reputation
- Systems/**city-level response**

## NATIONAL



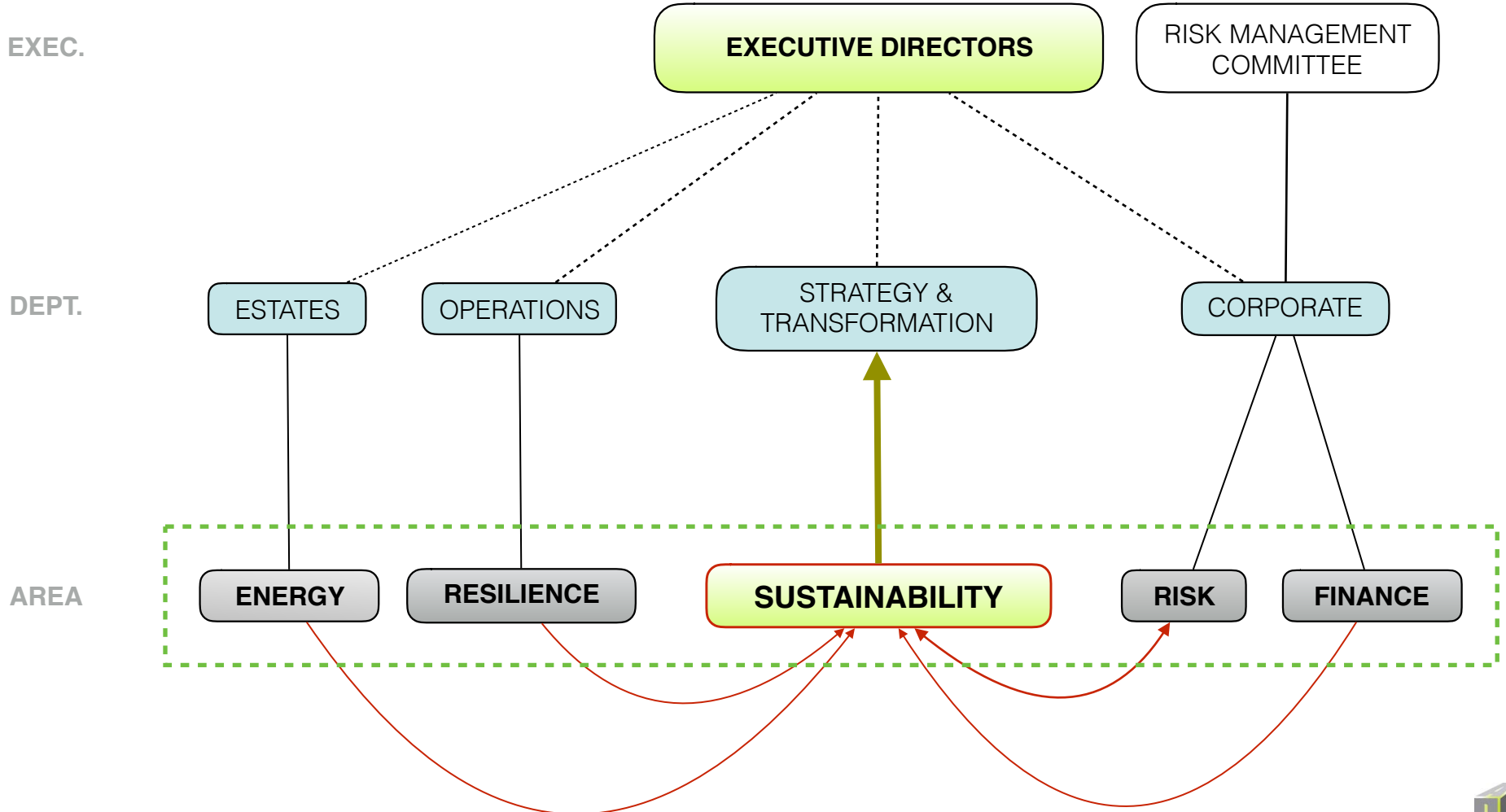
- **National Formula**
- **NHS Litigation**
- **NHS Supply Chains**

ORGANISATIONAL LEVEL:  
Mapping cross-departmental responsibility for climate risk



# ORGANISATIONAL LEVEL:

## RECOMMENDATION 1: **Expand Sustainability Forum**





# New world of risk: embracing the unknown

Perspectives on risk for the Social Housing sector

In association with  
**Ipsos MORI**



Risk	Description	Rank	Trend Indicator
1	Climate Change	B2	↗
2	Protecting Sensitive Data	B2	↑
3	Governance & Regulatory Issues	D1	↗
4	Failure to Manage Financial Plan	C2	↗
5	Reputational Damage	C2	↑
6	Supply Chain Management	B3	↔
7	Diversification	B3	↗
8	Demographic & Market Change	A4	↗
9	Fire & Explosions	C3	↔
10	Community Cohesion	D3	↗
11	Sustainability	E3	↗
12	Political Uncertainty	E3	↗
13	Loss of Critical Infrastructure	E3	↔