Climate change and health systems in the UK – impacts, vulnerability, and monitoring

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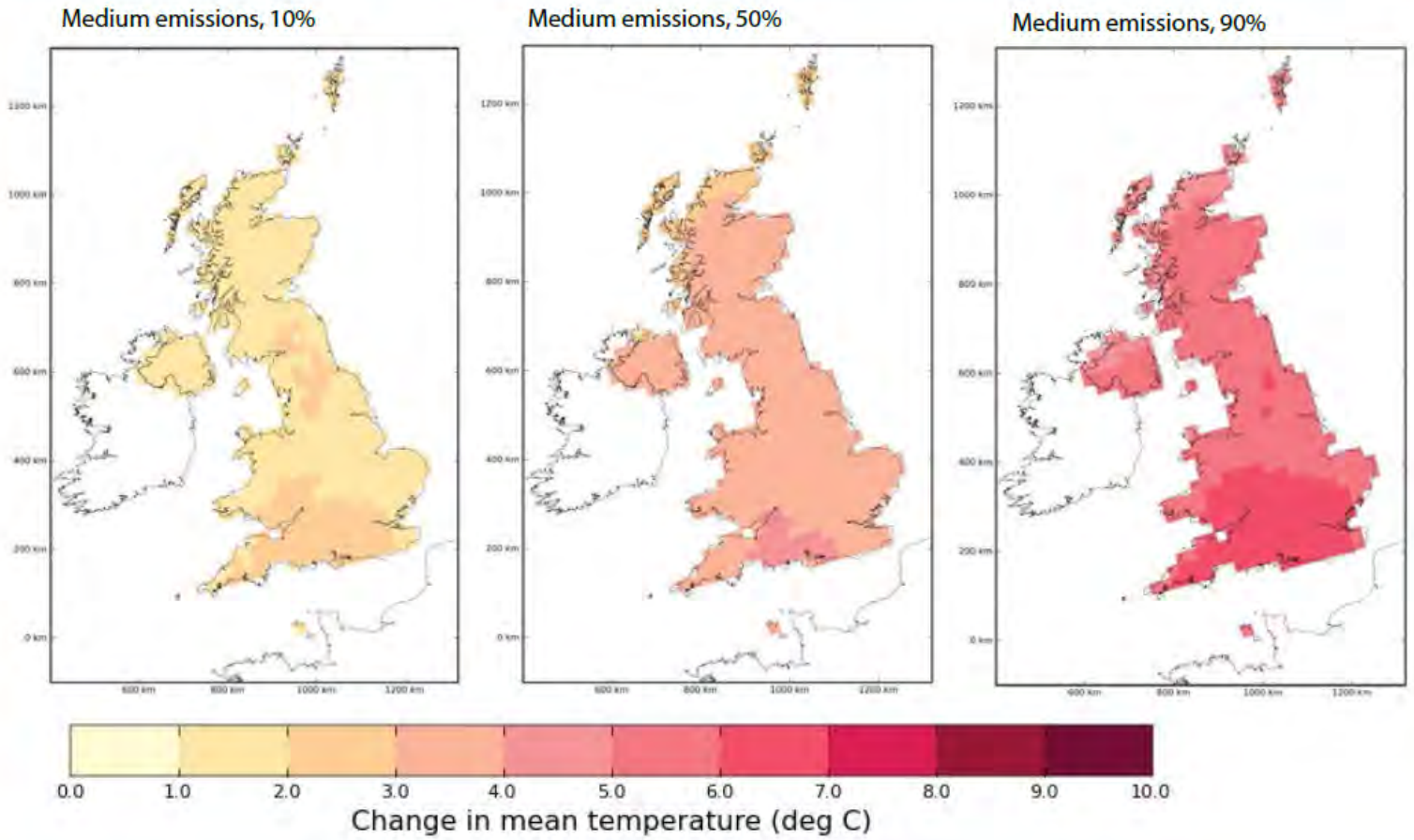
outline

- The UK Climate Change Risk Assessment
  - Key findings for health
- Evidence of the impact of extremes on health systems
- Monitoring progress on adaptation
  - indicators

Future projections of 30-year average summer temperature from UKCP09 in a 2-5 degree world

Figure 5.4. Future summer temperature projections for the UK for the 2050s



Source: UK climate projections 2009 (http://ukclimateprojections.metoffice.gov.uk/21708)
Notes: Maps show the range of projections in summer mean temperature for the period 2040-2069, medium emissions, from the 10% to 90% probability level.

Projections of extreme temperature and rainfall in a 3-4 degree world

Table 1.A1. Values of 20-year return period events for daily maximum surface temperature in summer (June-August), and accumulated rainfall over five consecutive days in winter (December-February)

City	Daily summer max temperature (°C)				5-day winter rainfall accumulation (mm)			
	1961-1990 Observed	2041-2060 Low	2041-2060 Central	2041-2060 High	1961-1990 Observed	2041-2060 Low	2041-2060 Central	2041-2060 High
London	34.4	34.1	37.2	40.6	56.1	57.8	62.5	68.3
Cardiff	31.7	31.9	34.7	38.1	73.6	76.6	79.8	83.6
Belfast	25.9	26.5	28.5	30.9	70.3	70.6	76.9	84.6
Edinburgh	23.5	24.8	26.2	27.9	63.4	63.5	70.0	78.4

Source: from Brown et al. (2014).
Notes: For each national capital, estimated observed values for 1961-1990 are compared with values for the 10th (low), 50th (central) and 90th (high) percentiles of probabilistic projections for 2041-2060 under the A1B emissions scenario. The values represent 25x25km^2 spatial averages, for locations on the UKCP09 grid (Murphy et al., 2009) containing national capitals. In order to derive observational estimates, the 5km gridded station dataset of Perry et al. (2009) was interpolated to the UKCP09 grid. Projections are obtained by applying the UKCP09 methodology to predict future changes in parameters controlling the properties of statistical EVD. The examples provided show cases where the results are robust to plausible variations in the methodology, based on sensitivity tests assessing the degree of consistency between the global and regional modelling components of UKCP09.

Source: Brown, S., Murphy, J., Harris, G. and Sexton, D. (2014) Climate projections of future extreme events accounting for modelling uncertainties and historical simulation biases. Climate Dynamics, 43, 2681-2705.

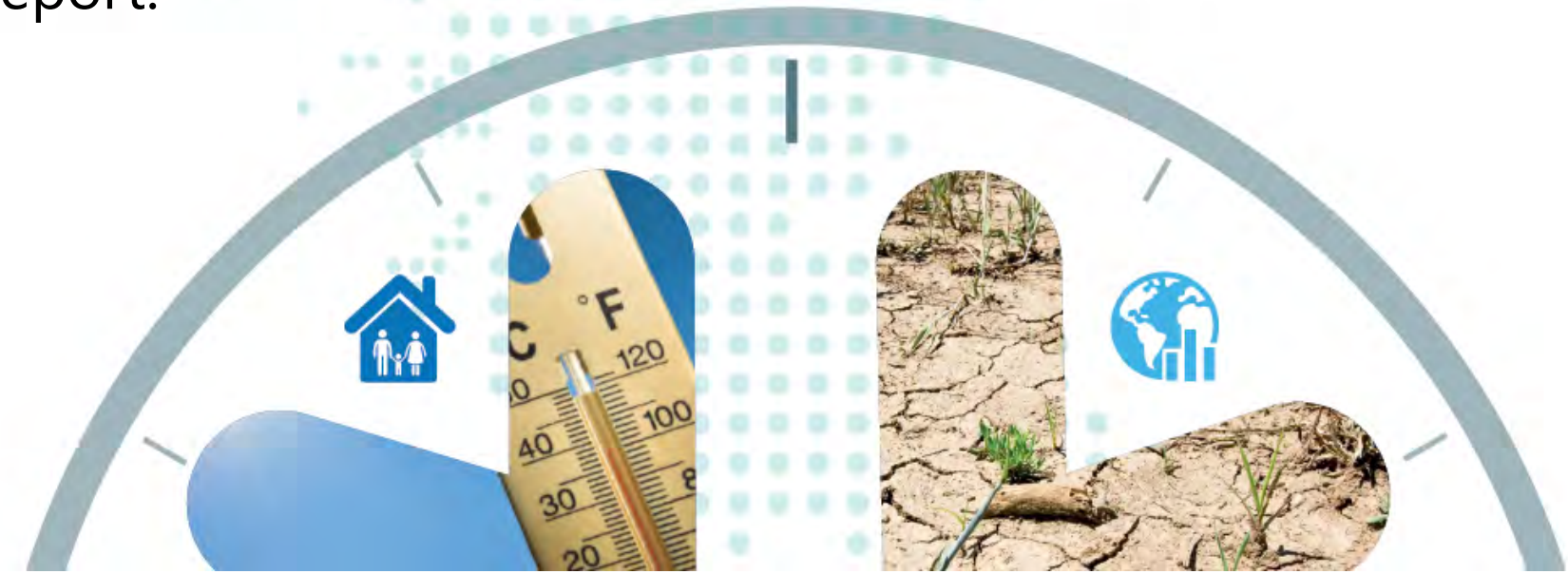
Committee on Climate Change

UK 2017 Climate Change Risk Assessment

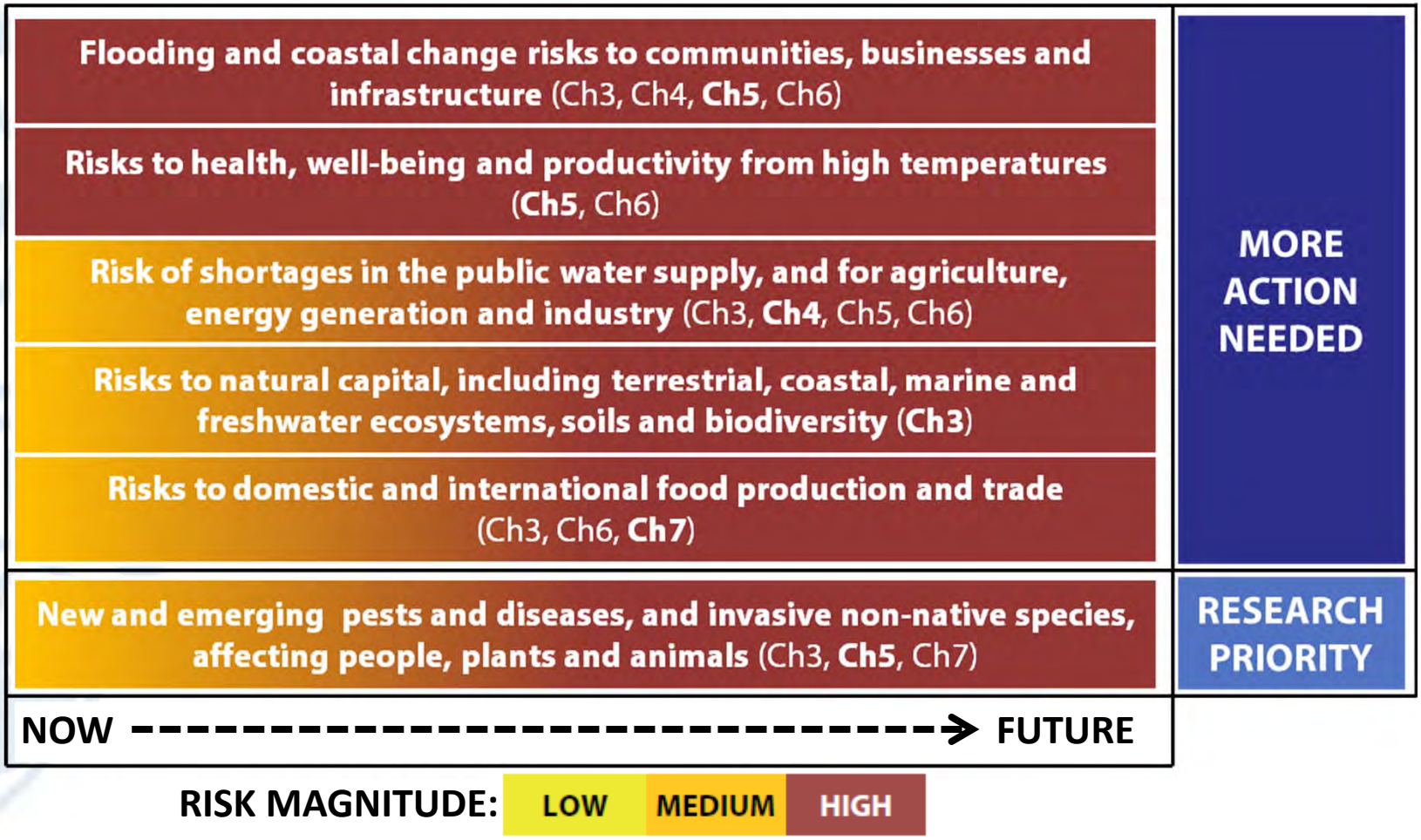
UK Climate Change Risk Assessment 2017

@theCCCuk
#UKClimateRisk

Evidence report: priorities for the next five years



UK Action on Climate Change
Six priority areas



Source: ASC (2016) *UK CCRA 2017 – Synthesis Report*

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KEY RISKS TO PEOPLE AND COMMUNITIES

OVERHEATING

There are currently 2000 heat-related deaths per year in the UK.

Heat-related deaths could reach 5000 per year by the 2050s, and even more if population growth is taken into account.

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KEY RISKS TO PEOPLE AND COMMUNITIES

Current

2050s

FLOODING

1.8 million people in the UK are living in areas at significant risk of flooding.

The number of people at risk is projected to rise to **2.6 million** in a 2°C global warming scenario.

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KEY RISKS TO PEOPLE AND COMMUNITIES

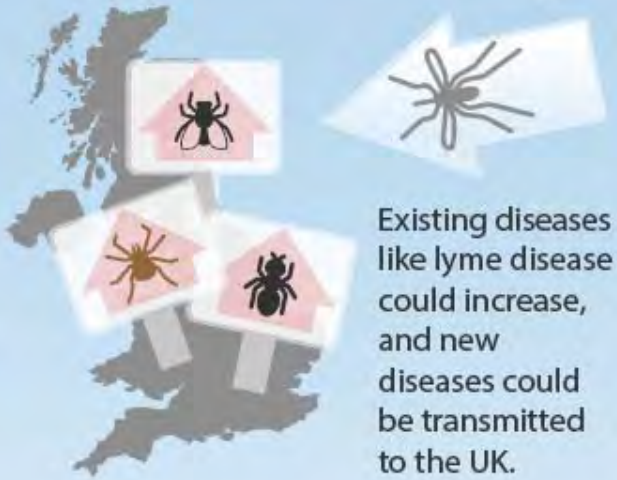
Current

2050s

PESTS AND DISEASES

People in the UK are already exposed to food and water-borne diseases such as campylobacter, and to diseases carried by some organisms, such as lyme disease.

The number of pests in the UK, such as ticks, ants and house flies, may increase due to climate change.



Existing diseases like lyme disease could increase, and new diseases could be transmitted to the UK.

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OUR WELLBEING INCLUDES...

ADAPT TO CLIMATE CHANGE *AND* IMPROVE WELLBEING BY...

- Increasing urban green space
- using sustainable urban drainage (SuDS)
- making temperatures in homes comfortable in winter and summer

INSTEAD OF...

- limited green space
- overloaded drainage
- overheating homes
- cold and damp homes

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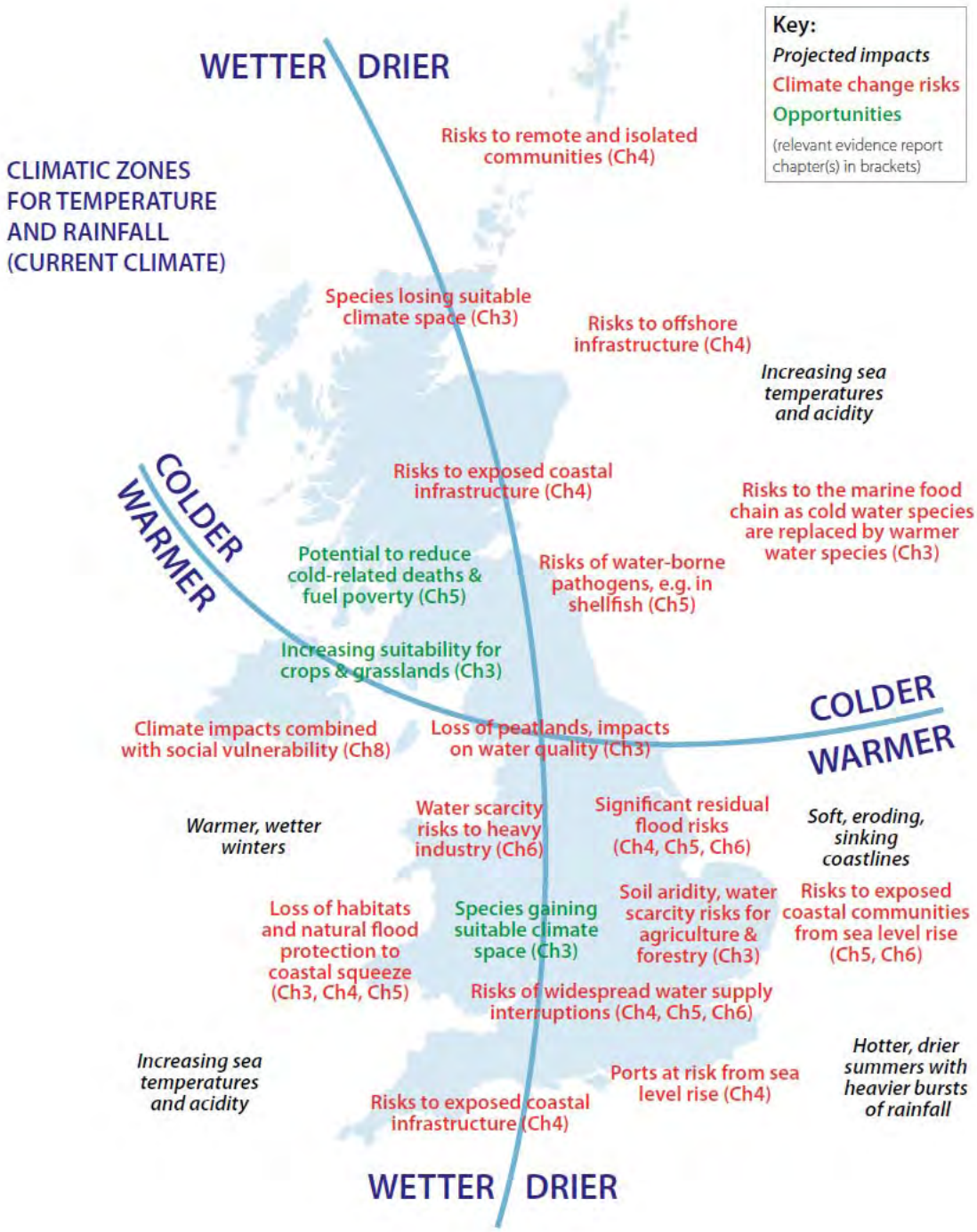

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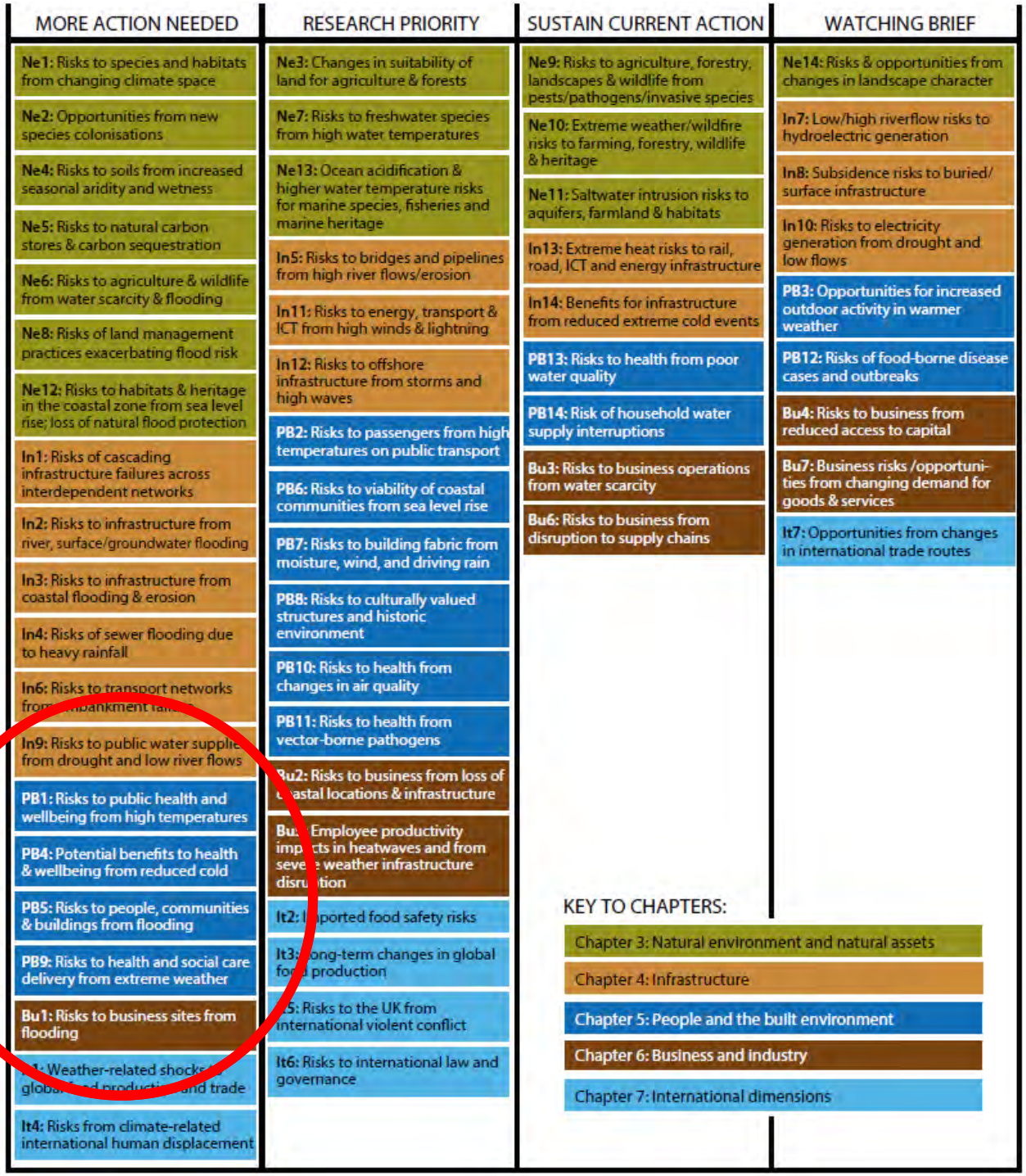
Risks vary in different parts of the UK



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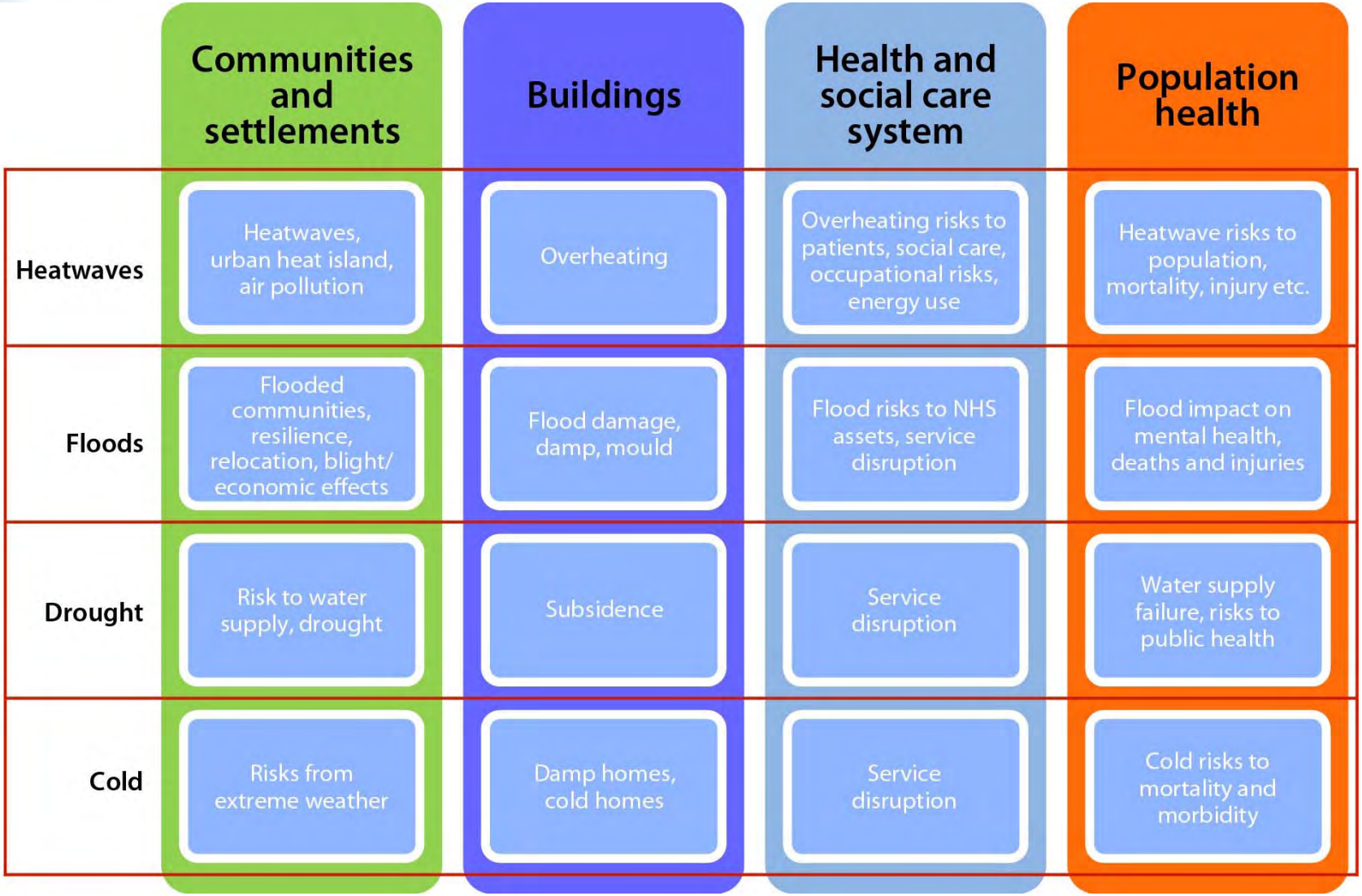
Resulting risks and opportunities are classed by urgency category, based on the evidence provided

Evidence...


Communities and settlements
Buildings
Health and social care system
Population health
Heatwaves
Heatwaves, urban heat island, air pollution
Overheating
Overheating risks to patients, social care, occupational risks, energy use
Heatwave risks to population, mortality, injury etc.
Floods
Flooded communities, resilience, relocation, blight/ economic effects
Flood damage, damp, mould
Flood risks to NHS assets, service disruption
Flood impact on mental health, deaths and injuries
Drought
Risk to water supply, drought
Subsidence
Service disruption
Water supply failure, risks to public health
Cold
Risks from extreme weather
Damp homes, cold homes
Service disruption
Cold risks to mortality and morbidity

Heatwave impacts

- Discomfort or distress of patients, and their visitors
- Equipment failure, such as failure of essential refrigeration systems
- Disruption of IT services
- Disruption of laboratory services
- Discomfort of staff (occupational health)
- Degradation or loss of medicines.

WHO, 2009, Carmichael et al., 2013).

Care Homes/Nursing homes

- Qualitative study(Gupta et al. 2016)

- Buildings - risk of summertime overheating, especially during short-term heat waves (2-4 days) with indoor temperatures rising to nearly 30ºC in communal areas and resident rooms.
- Non-structural factors that affected overheating risk include
  - fixed daily routines of care home residents making it difficult to accommodate periods of intense heat;
  - management structures and systems which do not always allow for staff to alter temperatures;
  - a culture which focuses on cold as the main climate risk

Flood impacts

- Disruption by staff shortages
- Infrastructure damage needs coordination across services
  - Mutual needed to transfer patients

- Difficulty identify at risk populations
  - Palliative care patients, complex/bariatric patients, language issues (migrant labour).

Boston flood

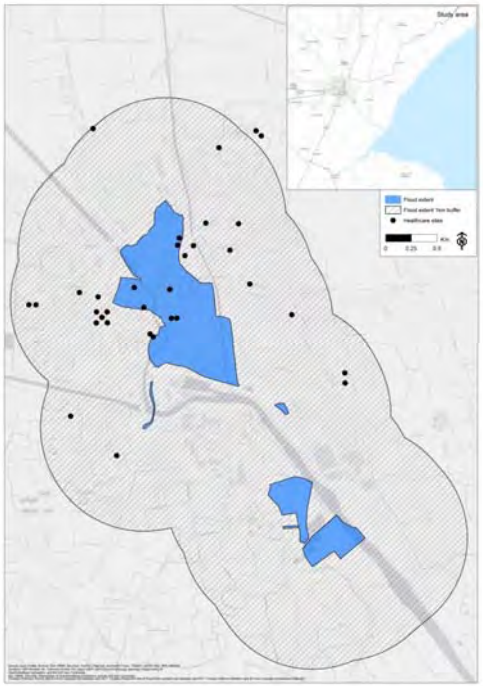


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Table 4.3. Overview of key climate risks for each infrastructure sector

Hazard / Sector	Floods	Water scarcity	High temperatures	(Wind) Storms	Geohazards (inc. subsidence and landslides)
Water and waste water	✓✓	✓✓	✓		✓
Transport	✓✓		✓	✓✓	✓✓
Energy generation	✓✓	✓	✓	✓	
Energy distribution	✓✓		✓	✓✓	✓
Flood and coastal defences	✓✓			✓	✓
Solid waste	✓		✓		
ICT	✓✓		✓	✓✓	✓

Source: Expert judgement arising from the literature reviewed in this chapter.
Notes: A single tick denotes a relationship; a double tick denotes a strong relationship. These do not consider dependencies between infrastructures.

Key points

- Floods, storms, snow and heatwaves already affect health system infrastructure and service delivery through effects on staff, buildings and equipment.
- **Heatwaves** affect the functionality of hospitals and care homes. Health services will be vulnerable to an increase in the frequency and intensity of heatwaves.
- **Flood** risks to NHS and social care assets are likely to increase under climate change. Future projections indicate an increase in the number of GP surgeries, care homes, emergency service stations and hospitals in the flood risk zone, with the largest change in risk generally shown for care homes. England and Wales show bigger increases in risk than Scotland and Northern Ireland.
- Cold spells and snow storms interrupt travel for patients and staff. Fewer cold events in future will benefit health system management.
- The capacity of the health and social care system to manage climate risks is unknown.
- Overall capacity could also decrease due to **fragmentation** of services which increases the complexity of risk management.

Adaptation options for dealing with climate risks

Climate change	Climate risk	Adaptation option
Higher temperatures	Hot weather, heatwaves	Managing UHI and outdoor temperature through planning, urban and building design and construction options
		Housing – building fabric, insulation and ventilation trade-off
		Heat health warning systems – public health responses
		Emergency planning
Increased intensification of rainfall	Flooding, coastal erosion and/or inundation	Reducing development in flood risk areas through planning, settlement design options
Sea-level rise		Property-level protection measures
Storms		Flood defence (sea walls, etc.) and natural flood management
Storm surges		Increasing resilience in communities (e.g. governance, connectedness and cohesion)
		Emergency planning

Limits to adaptation (current)

- Limited incorporation of the full scope of planning policy and its means of implementation in local planning processes and construction practices in new developments .
- Fragmentation of services. For example in health and social care sectors
- Gaps in building and construction codes
- Lack of appropriate governance (e.g. co-ordination or integration of efforts between and within national and local authorities; limited links to local communities)
- Lack of knowledge and research to provide greater granularity in flood risk and damage estimates
- Poor housing quality and lack of or inappropriate retrofitting
- Lack of co-ordination with other policies (e.g. energy efficiency in housing, invasive species policies that only focus on biodiversity).
- Low public perceptions of risk (heatwaves and floods).

Monitoring is difficult

- Process indicators
  - Adaptation Plans
  - Emergency Plans
- Exposure indicators
  - Flood events
  - Flooded care homes/hospitals
- Outcome indicators
  - ?Flood impacts?
  - ?Heat impacts

Monitoring & Reporting Framework for local authorities within the Covenant of Mayors Initiative

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Impacted Policy Sector	Expected Impact(s)
Buildings	Increased need for cooling, risk for flooding, increased need for maintenance
Transport	risk for flooded roads
Energy	Increased risk for damage to electric grid outside Växjö, due to storms
Water	More systems are needed to take care of storm water, risk for drought, risk for pollution of water
Land Use Planning	Increased risk for urban heating, flooding of buildings close to lakes and streams, flooding due to heavy rainfall
Agriculture & Forestry	increased attacks from insects and diseases, damages due to storms, floods
Environment & Biodiversity	changed ecosystems
Health	increased risks for diseases, risk for mortalityy due to increased heat

Climate Hazard Type	Risk Level	Expected change in intensity	Expected change in frequency	Timeframe
Extreme Heat	!!	↑	↑	▶▶
Extreme Precipitation	!!!	↑	↑	▶▶
Floods	!!	↑	↑	▶▶
Sea Level Rise				

Sector	Title (max. 120 chars)	Short description (max. 300 chars)	Responsible body/department
Health	Action plan for normal inside temperature	Priority level 1. An action plan is needed to make sure that indoor climate is acceptable in schools, hospitals etc during extreme outside temperatures	Educational Services, Elderly and Disabled Care Services, Municipal Housing and Property Companies
Health	Inform the public about health effects due to heat waves	Priority level 2.	Educational Services, Elderly and Disabled Care Services, Executive Office
Health	Educate key staff about health effects due to climate change	Priority level 2. Information and education directed towards staff and management within the departments of schools and elderly care.	Educational Services, Elderly and Disabled Care Services

Health →	Refers to the geographical distribution of dominance of pathologies (allergies, cancers, respiratory and heart diseases, etc.), information indicating the effect on health (biomarkers, decline of fertility, epidemics) or well-being of humans (fatigue, stress, post-traumatic stress disorder, death etc.) linked directly (air pollution, heat waves, droughts,

Findings:
EU review of adaptation

- New international agreements (Paris, Sendai, SDGs) created new need for alignment
- Need to implement the adopted National Adaptation Strategies (NAS)
- Reinforced need for sub-national action
- New knowledge about high-end climate change creates more need of sectoral climate proofing and disaster risk reduction
- Further need to involve business and insurers to ensure investments

Current evidence on evaluation of Heat Action Plans

- Outcome evaluation. Limited evidence for effectiveness of the system as a whole
  - Non-specific, before and after comparison
  - No information on implementation.
  - Effectiveness may be limited under very high temperatures

- Process evaluation of implementation
  - Difficulty reaching front line staff
  - Care home managers.

- Process evaluation of general public
  - general public, knowledge and perceptions.
  - Difficult to access the perceptions of those most at risk

Conclusions

- Extreme weather effects health and social care delivery
- Adaptation measures are in place- emergency planning
- But it is difficult to assess the level of preparedness/resilience,
  - especially at regional/national level
- Concern about complex events
- Evidence gaps for specific measures
  - Occupational risks
  - Drug management