Climate change impacts in Northern Ireland

The use of local knowledge in climate risk assessments

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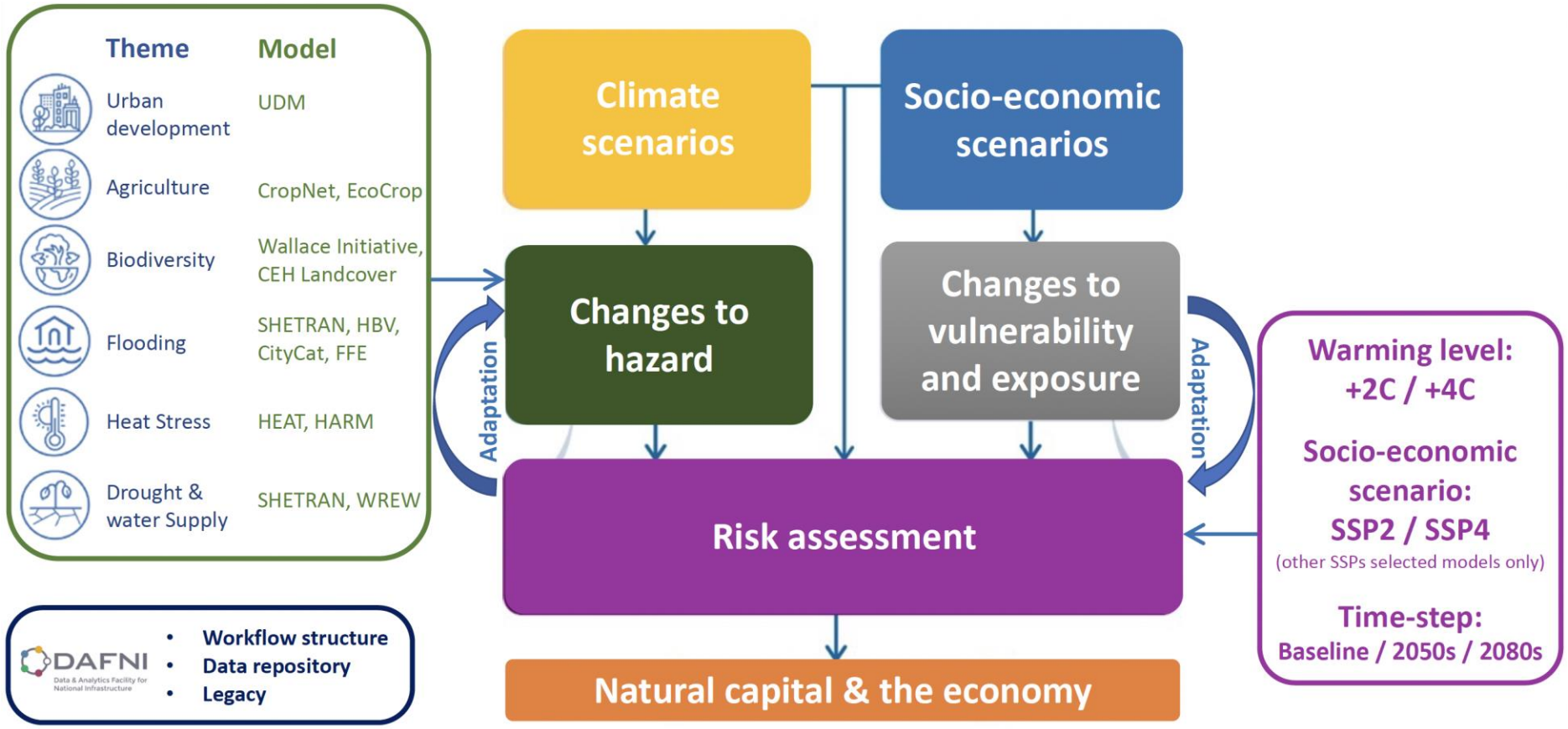
27 May 2025

OpenCLIM

Vision: *Integrated risk and adaptation models across multiple sectors in an open framework*



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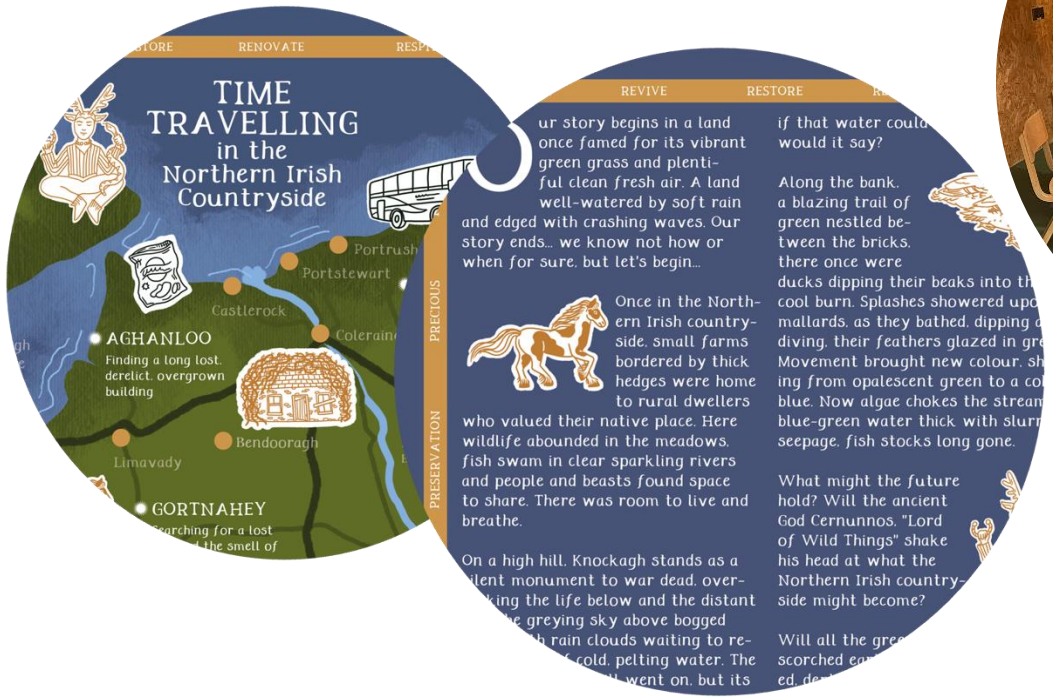
Once Upon a Time in a Heatwave

Aim: *explore the use of storytelling methods to communicate climate science and climate change impacts and risks in Northern Ireland*



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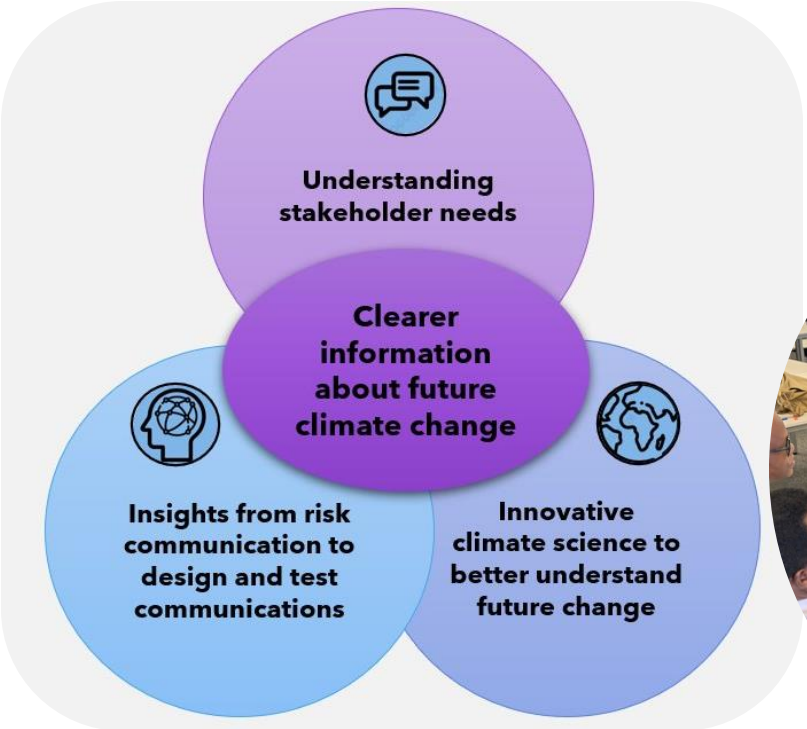
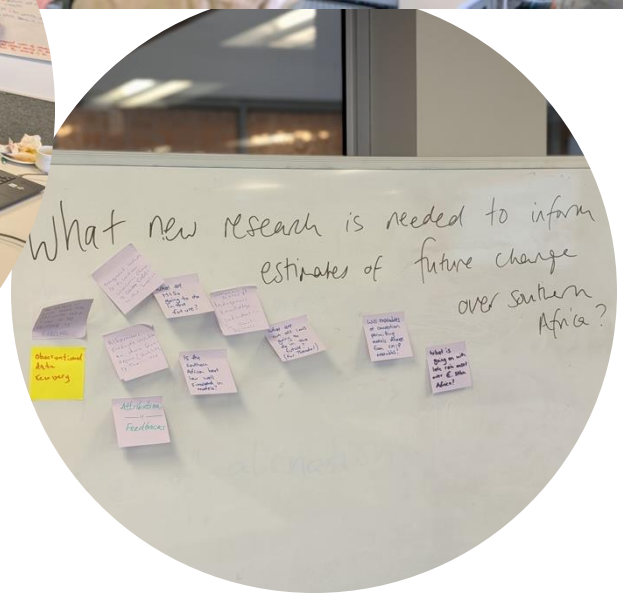
Salient

Aim: *exploring new ways to understand and communicate future climate change for adaptation planning, focussing on southern Africa*





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Salient

Coming up…

1. Results from these papers, presented in fact sheet format
2. Feedback on the fact sheets to steer future research and outputs
3. Reflections on potential adaptation and the use of local knowledge in research

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The role of local knowledge in enhancing climate change risk assessments in rural Northern Ireland

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ABSTRACT

Climate risk modelling provides valuable quantitative data on potential risks at different spatiotemporal scales, but it is essential that these models are evaluated appropriately. In some cases, it may be useful to merge quantitative datasets with qualitative data and local knowledge, to better inform and evaluate climate risk assessments. This interdisciplinary study maps climatic risks relating to health and agriculture that are facing rural Northern Ireland. A large range of quantitative national climate risk modelling results from the OpenCLIM project are scrutinised using local qualitative insights identified during workshops and interviews with farmers and rural care providers. In some cases, the qualitative local knowledge supported the quantitative modelling results, such as (1) highlighting that heat risk can be an issue for health in rural areas as well as urban centres, and (2) precipitation is changing, with increased variability posing challenges to agriculture. In other cases, the local knowledge challenged the national quantitative results. For example, models suggested that (1) potential heat stress impacts will be low, and (2) grass growing conditions will be more favourable, with higher yields as a result of future climatic conditions. In both cases, local knowledge challenged these conclusions, with discomfort and workplace heat stress reported by care staff and recent experience of variable weather having significant impacts on grass growth on farms across the country. Hence, merging even a small amount of qualitative local knowledge with quantitative national modelling projects results in a more holistic understanding of the local climate risk.

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Castlederg

Care in weather extremes

Alan Kennedy-Asser
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October 2022

Context

The town of Castlederg in Co. Derry/Londonderry currently holds the record for being both the hottest and coldest place in Northern Ireland (at the time of writing). Between the maximum temperature during the heatwave of 2021 (31.3 °C) and the minimum of the winter of 2010 (-18.7 °C), a 50 °C temperature range has been recorded in the past 12 years. Many UK studies of heat extremes focus on urban areas, due to the amplification effect of the urban heat island, however, in Northern Ireland the warmest temperatures are often recorded in rural areas, particularly in the west of the country. This report looks at the impacts of these heat extremes on a rural community, as well as highlighting steps that have been taken in Castlederg to improve resilience to such extremes. Many of these steps were taken at an individual grass roots level and could be seen as 'common sense', however they are generally in line with advice in other warmer regions, such as England, and show how climate adaptation practices can in many cases be easily adopted. It is hoped these steps can be adopted elsewhere in Northern Ireland to adapt to rising global temperatures.

Data collection

On 21st July 2022, a year on from the temperature record set in 2021, a number of semi-structured interviews were carried out with members of the local community in Castlederg, particularly those in positions of care. Additionally, a number of informal conversations were had with other local people throughout the day, for example in the library and local businesses. Some follow up phone calls and emails were made to reach other relevant stakeholders who could not meet on 21st July. An engagement activity was also run with a local youth summer scheme (see box *The Castlederg Temperature Scale*). In this report, interviewees will be left anonymous, however the context of their work will be stated if relevant. Given the nature of this short one-day study, it should not be seen as exhaustive, however valuable information can still be learnt which could be shared with other communities in Northern Ireland and beyond.

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Heat-related mortality

What is heat-related mortality?

Mortality rates (deaths) increase with warmer temperatures throughout the year.
Temperatures do not need to be extreme to increase mortality rates:
18 °C or higher can cause statistically higher death rates.
With global warming, summers will be hotter and mortality will increase.

Global warming

+2 °C **22 deaths per year**
(minimum = 16, maximum = 36)

+4 °C **98 deaths per year**
(minimum = 61, maximum = 142)

(This assumes population increases following SSP5 in 2080)

7 in 10 deaths will occur in rural areas

>75%

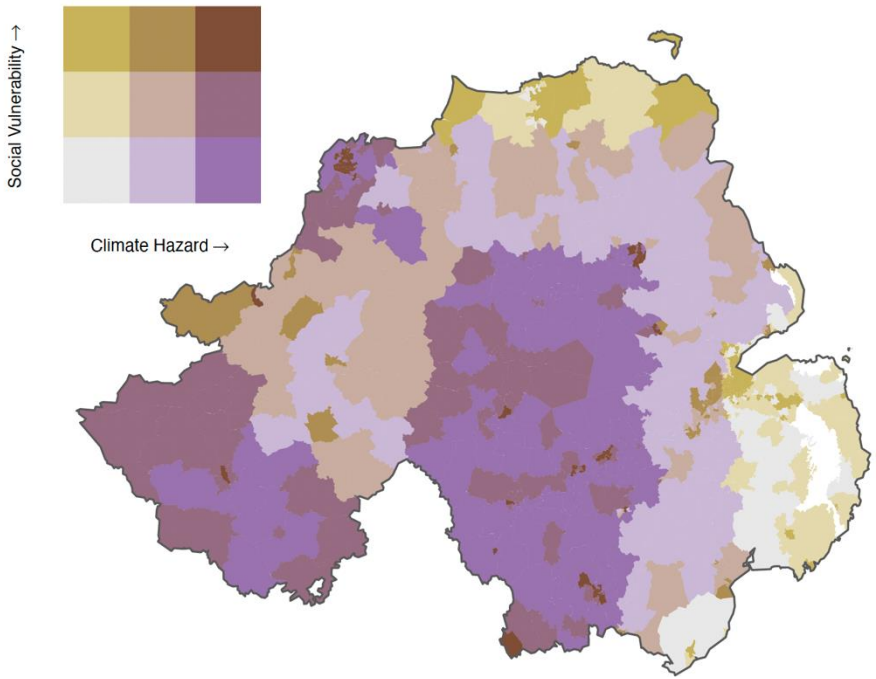
of deaths would be avoided if warming was limited to 2 °C

Heat risk

How is risk measured?

The risk to society from heat considers multiple factors:

- **Temperature** and **humidity** are important *hazard* factors defining the severity of heat.
- **Population density** affects the *exposure* – i.e. the number of people affected.
- **Age** (over 65) and **deprivation** can increase a population's *vulnerability* to heat.



Hazard factors (temperature and humidity) vary over a large scale across Northern Ireland: **central, southern and western areas are most affected.**

Vulnerability and exposure factors vary on a smaller scale: **some localised areas emerge as higher risk,** including Ballymena, Newry, Craigavon and Castlederg.

Risk depends on the weighting of factors. Explore more here: https://akaresearch.shinyapps.io/heatstressvulnerability/

Freezing days

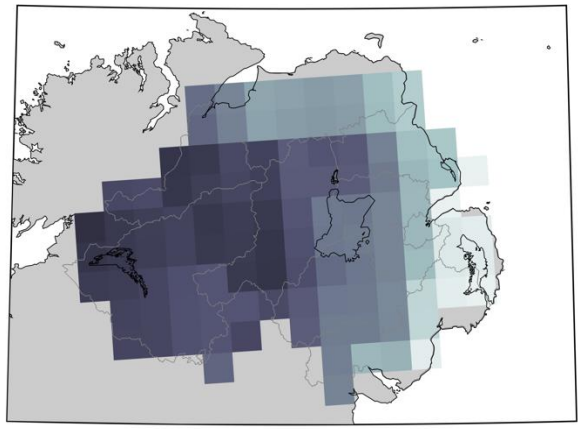
About freezing days

Days when daily average temperatures do not rise above 0 °C have impacts on transport, particularly in rural areas. Risks of slips and falls also increase. They can also have impacts on agriculture and horticulture, with heavy frosts potentially damaging plants.

Inland and southwestern areas are most affected by freezing days, with a small risk even in a warmer world.

Up to 8

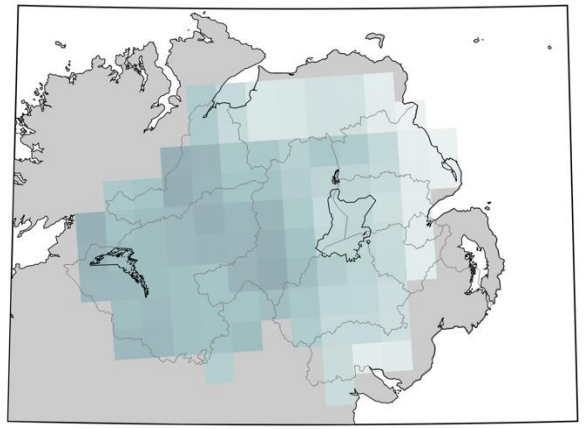
freezing days per year



Present day

Up to 5

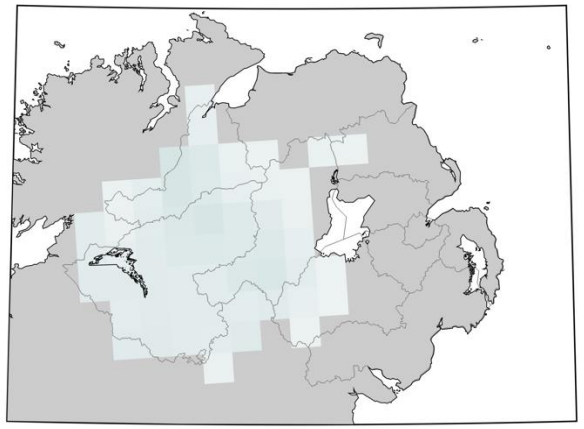
freezing days per year



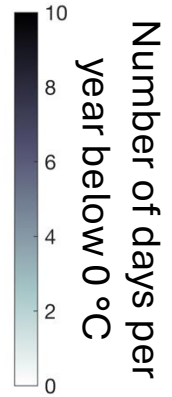
+2 °C

Up to 2

freezing days per year



+4 °C



Feedback time

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Crop yields

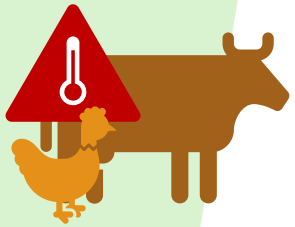
How will climate change affect crops?

Changes in temperature, water availability, and atmospheric CO_2 all affect plants.
Warmer temperatures and higher CO_2 will generally promote growth.
Periods of particularly wet or dry conditions will limit growth.

	+2 °C	+4 °C
Perennial rye grass	5-10%	3-36%
Wheat	10-40%	3-67%
Oil seed rape	7-17%	9-41%

In general, all crops assessed are expected to have higher yields due to climate change.

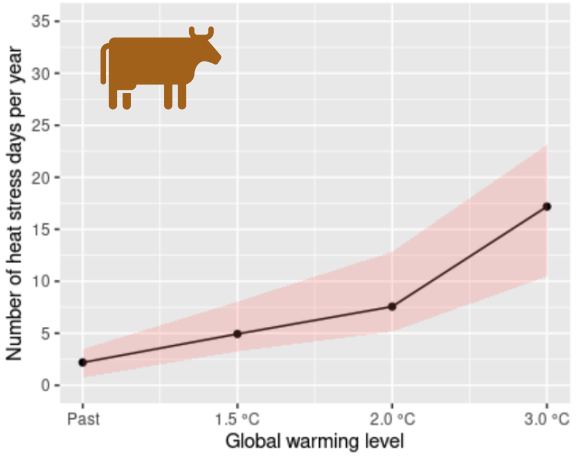
The exact yield increases depend on how much CO_2 will benefit growth, which is uncertain. There will also be variability between seasons.



Livestock heat stress

How will climate change affect livestock?

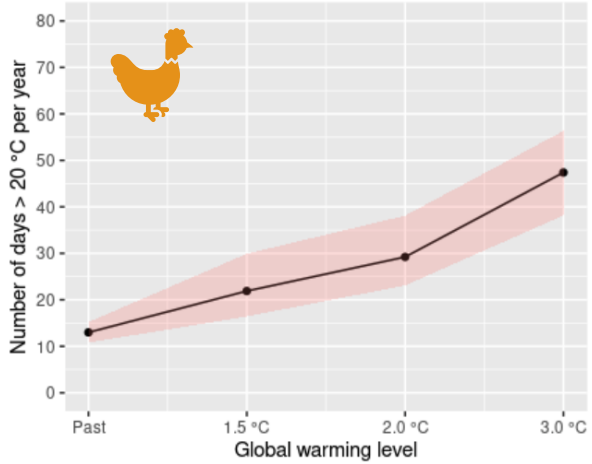
Dairy cattle are at risk of heat stress when temperatures and humidity are high.
Temperatures over 20 °C can affect the welfare of poultry.
Studies have linked weather conditions to milk yield and poultry feed intake.



Dairy cattle heat stress days

more than double

with warming of 3 °C
compared to 2 °C



Poultry heat stress days

increase by over 50%

with warming of 3 °C
compared to 2 °C

Milk yield and feed intake reductions are projected by models to be small (<1%).

However, models may underestimate this risk.

Dairy cattle heat stress has been already reported by farmers in Northern Ireland and

~10% of farmers

reported temperature impacts on their farm.

Hydrology

What is hydrology and how is it changing?
Rainfall and river flow are termed hydrology. A warmer atmosphere will amplify the hydrological cycle, which will have knock-on effects on river flows.
There is some uncertainty in the modelled trend in response to global warming.

Future trend summary	*Model agreement on summary* +2 °C	+4 °C
Wet periods will get **wetter**	**50-75%**	**50-90%**
Median conditions will get **drier**	**60-90%**	**75-100%**
Dry periods will get **drier**	**50-75%**	**65-100%**

5 in 10 farmers reported rainfall-related impacts on their farms

3 in 10 farmers reported challenges from unpredictable weather

Feedback time

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Reflections on potential adaptation and the use of local knowledge in research

Diversity of climate impacts and resilience

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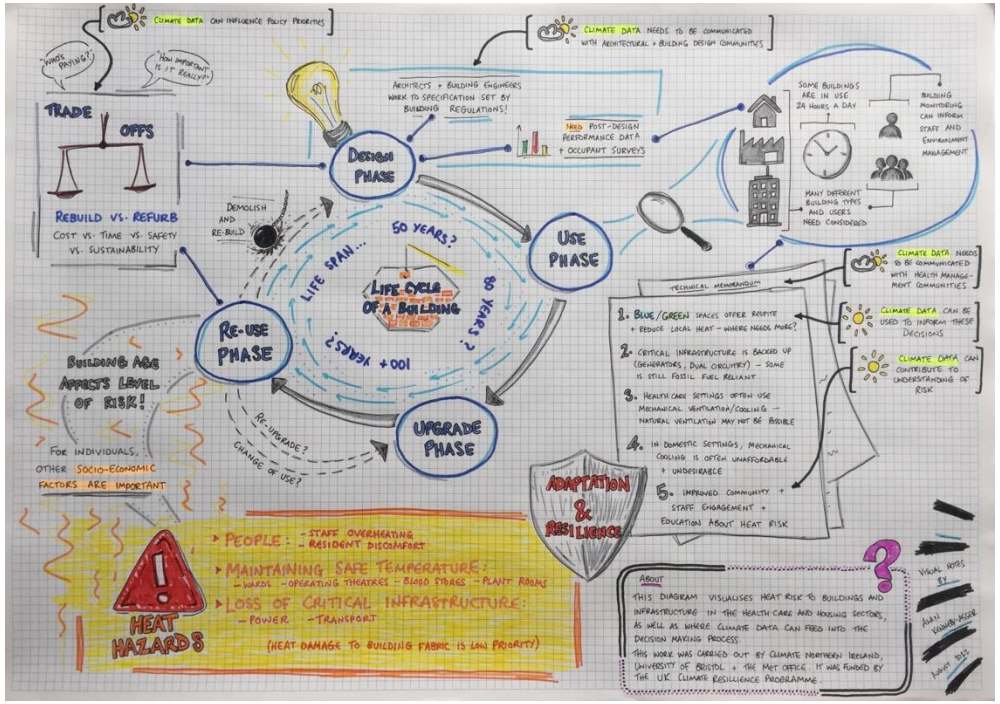

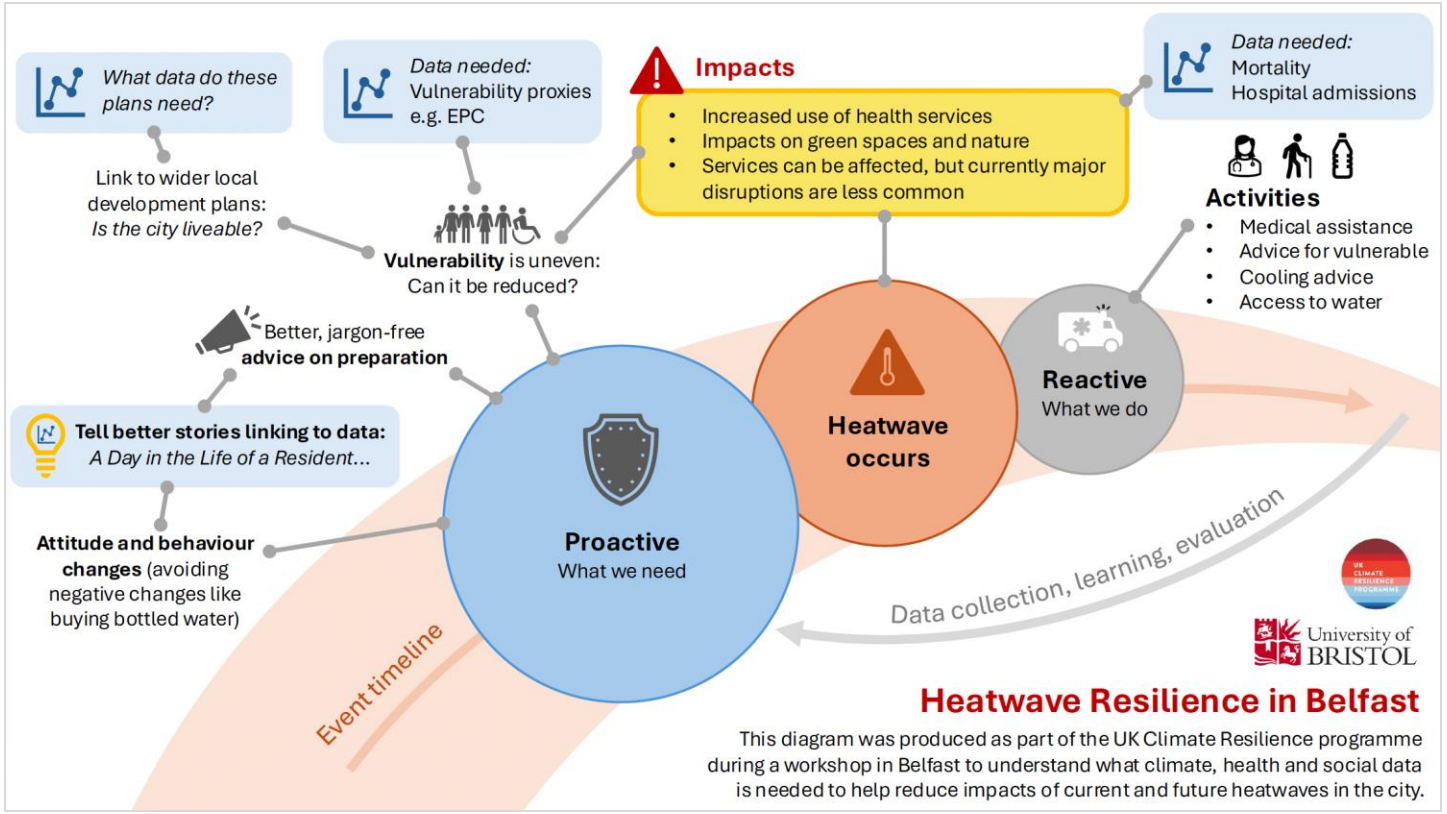

Understanding decision contexts and data requirements

Microclimates and use of data across spatial scales

Take home messages

Climate change impacts in Northern Ireland are multiple and varied

Large scale data products are useful tools, but only tell part of the story

Thanks for listening!

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