Storylines in CANARI
An Introduction

The CANARI programme is developing **physical climate storylines**[1] to characterise the potential impacts of climate change on the UK and potentially disruptive change in the Arctic. Co-developed high-impact storylines will be used for stress testing and evaluation of adaptation options, contributing to improved resilience and climate adaptation planning in the UK.

What is a storyline?

Plausible scenarios describing a chain of climate-related events, and processes that show cause-effect over a period of time that could lead to high impact events.[3]

Storylines:

- Focus on the physical aspects of climate change (e.g. such as changes in atmospheric circulation patterns and their influence on extreme events) and can link with human aspects.
- Can be developed independently from and explore plausible outcomes beyond the range of traditional climate model projections.
- Emphasise understanding of the driving factors of extreme events, and the plausibility of those factors.
- Interpret the observed record & past events and describe plausible futures.
- Represent uncertainties and enable uncertainties to be partitioned.
- Focus on what the impacts could be in a pathway of events, rather than predicting what will happen.

Storyline example in the UK

The National Flood Resilience Review, commissioned after severe flooding across winter 2013/14, used new large ensemble climate model simulations to examine 'black swan' events - physically plausible extreme rainfall totals in excess of current observational records. Storylines of unprecedented winter rainfall events were produced and used to drive a local hydrological model to estimate flood extent and assess the appropriateness of existing adaptation measures.

Figure 1 shows how weather and climate factors interact with the environmental and ecosystem factors to create a complex risk landscape.

Emergency pumps on the Parett, by Noel Jenkins, CC BY-SA 2.0

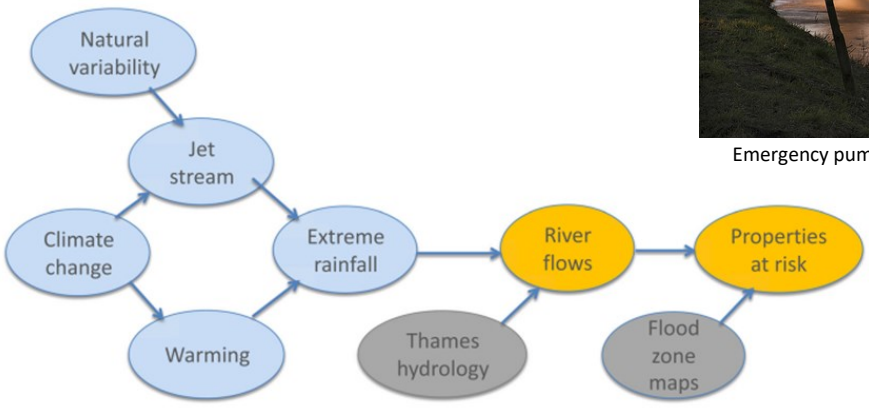

Figure 1. Causal network for discussion of Thames Valley flooding. Arrows indicate the direction of causal influence, but can include the effects of feedbacks. From Lloyd and Shepherd (2020)[2]

How can storylines be used?

Storylines can be used to represent uncertainty in physical aspects of climate change and can be used for different purposes.[4]

Improving risk awareness by framing risk that relates to experienced events (e.g. floods, extreme drought) rather than a probability of an event occurring (e.g. 1 in 1000 years). People can relate more to an event that they have lived rather than more abstract facts.

Strengthening decision making - storylines enable a way to explore uncertainties in a traceable and physically plausible manner. They can be used to prepare for a future event or used to work backwards from a decision point. Storylines can help communicate the consequences of climate change in ways that are relevant to decisions or decision-makers.

Adaptation options - Naturally suited to non-probabilistic decision-making frameworks, which seek adaptation options that are robust within a context of deep uncertainty

Considering risks from compound extreme events, namely those where severe impacts are triggered by the interaction of more than one variable (e.g. drought and heatwave). Individual variables do not need to be very extreme, but the combination results in severe impacts. Climate information can be easily combined with other factors in storylines to address compound risks.

CANARI Storylines

CANARI will co-develop physical climate storylines relevant for a range of specific UK impacts with partners and stakeholders.

Adaptation and resilience are critical pillars in the world's response to climate change. We urgently need to understand whether current management strategies and climate adaptation plans are adequate in the light of potential changes to the UK's weather, climate, and shelf seas.

Currently, we are developing event-based storylines on:

- Future UK extreme droughts
- Future UK extreme winds
- Ocean heating & sea level change

Credit: David Cole / Alamy

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References

[1] Chapter 10, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

[2] Lloyd, E.A, & Shepherd, T.G. Environmental catastrophes, climate change, and attribution, (2020).

[3] Storyline definition EU RECEIPT project.

[4] Shepherd, T.G., et al. Storylines: an alternative approach to representing uncertainty in physical aspects of climate change, (2018).