



Workshop 3

Adaptation of infrastructure to climate change: the end user's perspective

In partnership with





SOUTH WEST
INFRASTRUCTURE
PARTNERSHIP



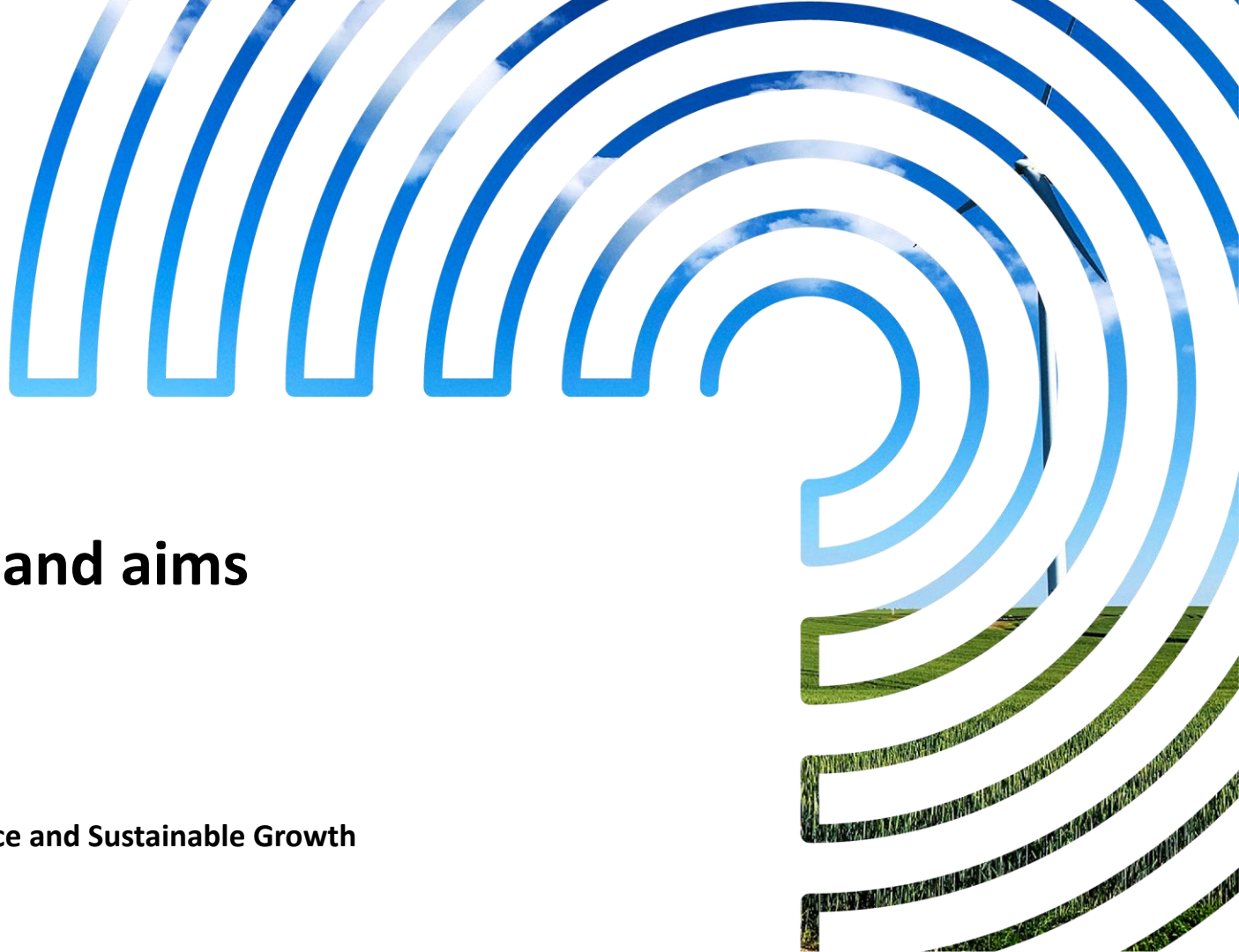
Welcome

Miranda Housden

Regional Director, ICE South West

Programme

12:46 - 12:55	Introduction and aims – Julie Gregory, Senior Programme Manager, Network Rail
12:55 - 13:10	A learning journey approach to behaviour change: attaining five key learning outcomes – Prof. Colin Taylor
13:10 – 13:25	Climate science, communicating to end users and frequent misinterpretations – Prof. Richard Betts
13:25 - 13:40	Why and how to engage communities with net zero and beyond – Dr Christina Demski
13:40 - 13:50	Q&A for all three speakers
13:50 - 13:55	Introduction to breakout session 1 – Prof. Colin Taylor
13:55 - 14:40	Breakout session 1 - Exploring the diversity of end user perspectives and needs
14:45 - 15:00	Reflections on end user perspectives across multiple sectors – Dame Janet Trotter
15:00 - 15:15	Applying Adaptation Pathways: some end user perspectives – Peter Von Lany
15:15 – 15:25	Q&A for both speakers
15:25 – 15:35	Feedback from breakout session 1 & introduction to breakout session 2 – Prof. Colin Taylor
15:35 – 16:15	Breakout session 2 - How do we meet the diversity of end user needs?
16:15 – 16:25	How can SWIP support you to develop your own approach? – Prof. Colin Taylor
16:25 – 16:30	Closing remarks – Miranda Housden



Introduction and aims

Julie Gregory

Head of Weather Resilience and Sustainable Growth
Network Rail

What have we learnt?

Workshop 1 (February 2024)

- Understood cross-sectoral picture
- Challenges, opportunities
- Nature based solutions

What factors should be considered when deciding what course to take



Cost Considerations:	15%
Environmental Impact:	20%
Flexibility and Adaptability:	20%
Social and Community Impact:	20%
Technological Considerations:	10%
Regulatory and Policy Factors:	10%
Supply Chain and Local Context:	5%
Conducive to Thought and Practice Leadership:	2%



What are the examples of Climate Adaptation you can give from your Sector



Heating:	7%	Flooding:	13%	Sea Level:	4%
Sustainability:	18%	Policy & Standards:	22%		

What have we learnt?

Workshop 2 (May 2024)

- Client's perspective
- What's stopping us? – and what is needed to overcome the barriers



2. What is needed to build collaborative partnerships across sectoral boundaries?



- Transparency and Information Sharing - 21%
- Collaboration and Relationship Building - 20%
- Legislative and Regulatory Frameworks - 7%
- Organizational Culture and Leadership - 26%
- Economic and Financial Considerations - 12%
- Strategic Planning and Management - 14%

Aims of today

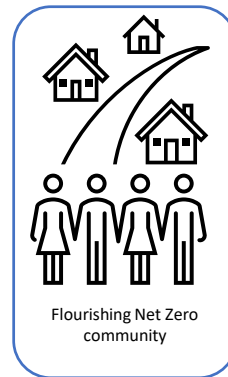
- Consider the needs of the end-users
- Understand the breadth of diversity of end-users
- Tactics to improve how we deliver climate-adapted infrastructure for end-users
- Draw together learning and think about how SWIP can support further progress





Enjoy the day!

A learning
journey
approach to
adapting
behaviour:
attaining five
key learning
outcomes



Flourishing: Growing vigorously in a congenial
environment (OED)

Prof Colin Taylor BSc PhD CEng FICE

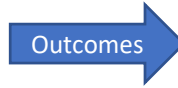
Emeritus Professor of Earthquake Engineering , University of Bristol
Institution of Civil Engineers Policy Fellow for Sub-National Infrastructure Decarbonisation

colin.taylor@bristol.ac.uk

Infrastructure shapes behaviour and enables life outcomes



Safe, affordable, decarbonised, crossing service
(part of our congenial environment)



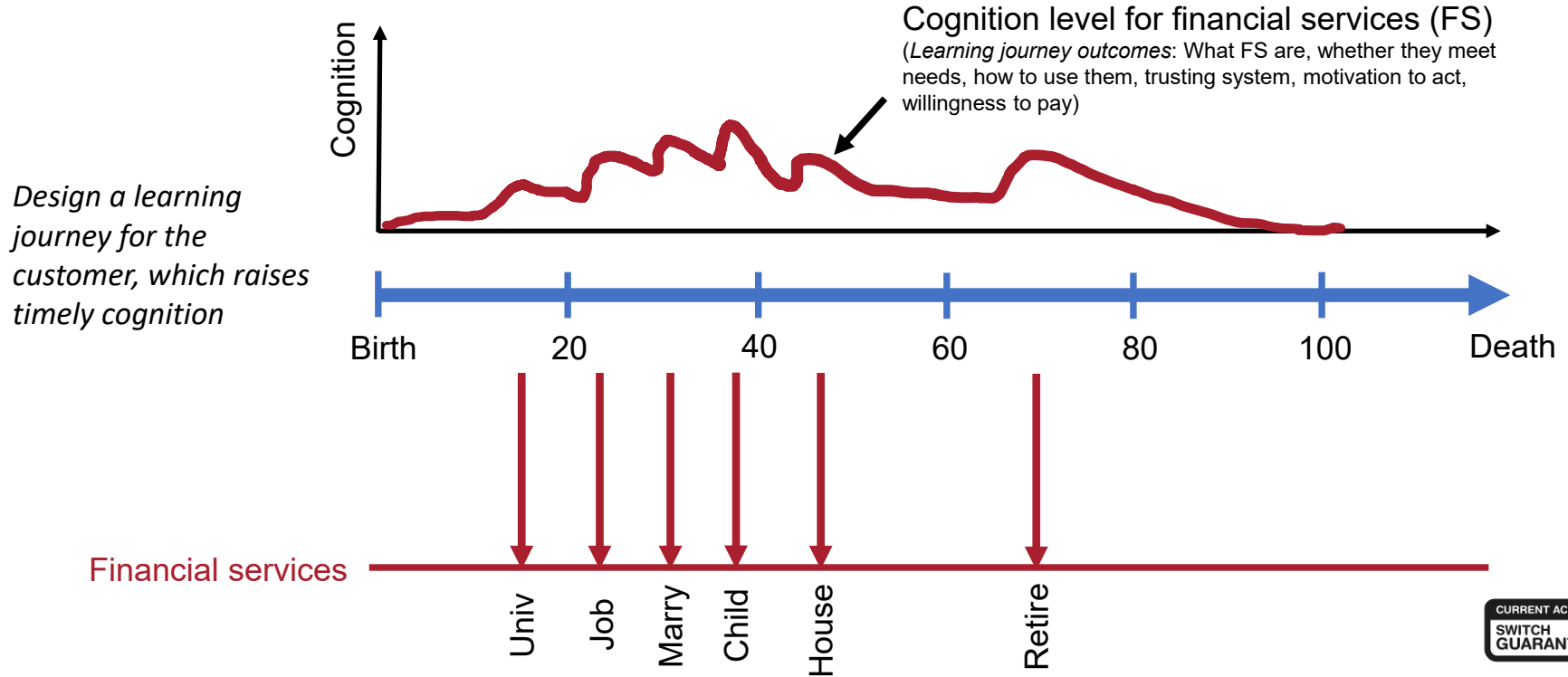
Enabling decarbonised life outcomes:
Education, employment, wealth,
health, happiness, well-being,
... flourishing in a Net Zero world
Offering beneficial behaviour choices
Help users learn and choose



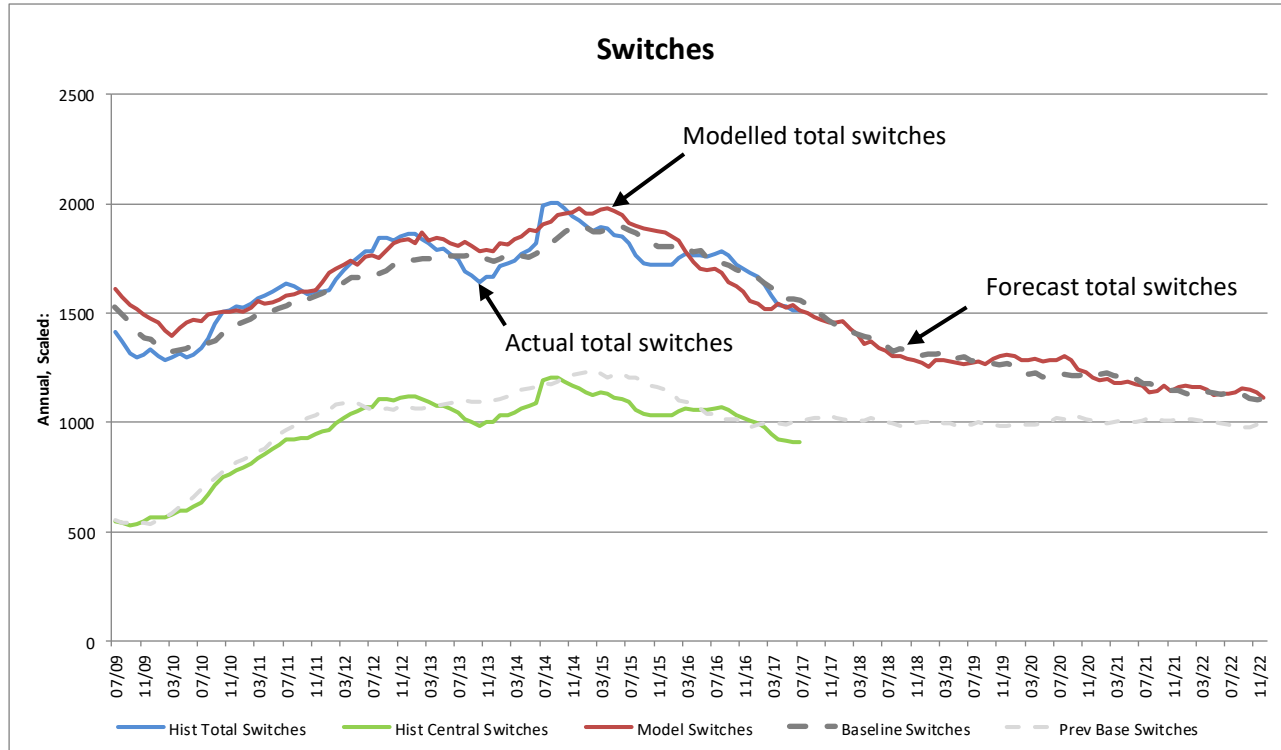
Choosing a beneficial course of action

From Current Account Switching to decarbonising
our life

Life journey interactions with infrastructure services – current account switching



Learning-based ABM model of current account switching behaviour



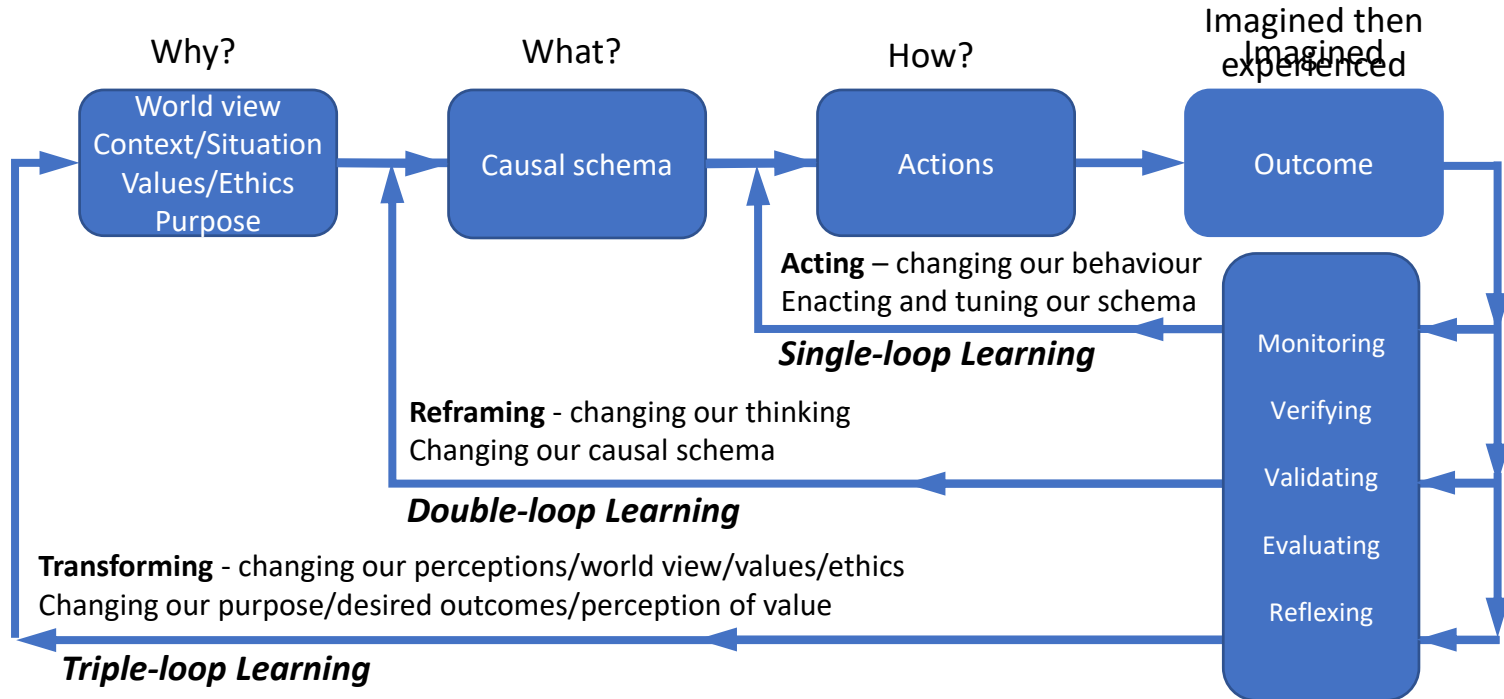
- Model revealed the 5 key learning outcomes
- Highly granular customer segmentation
 - Different life situations
 - Different worldviews
 - Different needs
 - Changing over lifetime
- Marketing targeted accordingly so that customer is well-informed when they want to switch



A bit of learning science

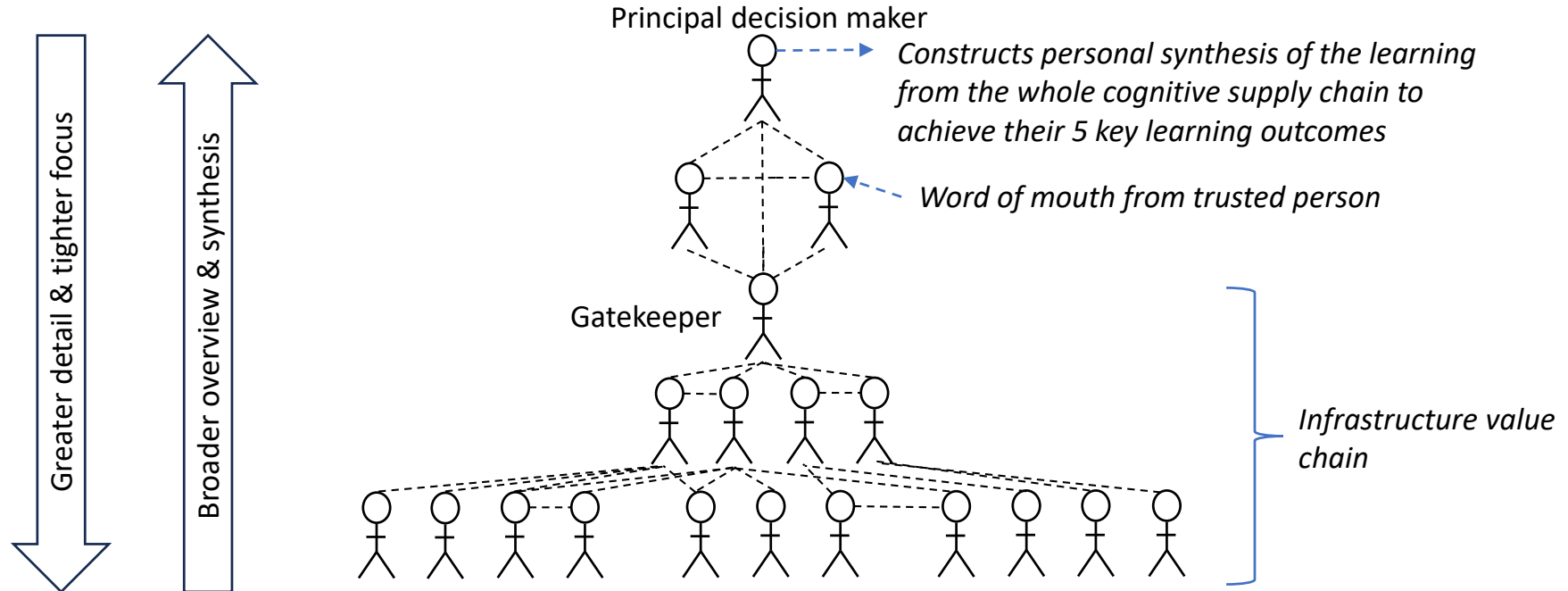
Learning cycles are natural

Triple-loop learning



Cognitive supply chain

Common purpose: enable the principal to build an authentic mental model trusted by their subconscious mind



Align individual learning journeys to ensure the integrity and validity of the whole cognitive supply chain

Our learning dispositions

- We each learn differently
- Different life-long learning journey & experiences
- Different worldviews
- Different mindsets
- Different knowledge bases
- Different taken-for-granted
- Different learning power dispositions
- We must accommodate these differences when collaborating & disseminating our knowledge up and down the cognitive supply chain
- Think of the recipient's learning disposition, and the learning journey you are taking them on, in your reports, presentations, conversations, designs, etc



Image courtesy Prof Ruth Crick - <http://www.wildlearn.co>

Five key learning outcomes

When we choose & carry out a course of action, we have met 5 key learning outcomes

1. We have clarity of purpose – we know the outcomes we want to achieve and why they are valuable to us
2. We know the course of action options available to us, and which is best to achieve our desired outcomes
3. We have secure trust in the people, knowledge, and tools we need to engage with to carry out our chosen course of action
4. We believe we know what to do, know how to do it, and are empowered to do so
5. We are motivated to carry out our chosen course of action

Clear Purpose - Best Course of Action - Trust in People, Knowledge, and Tools - Self-belief and Empowerment - Motivation

<https://www.ice.org.uk/events/past-events-and-recordings/recorded-lectures/cultivating-a-net-zero-mindset>

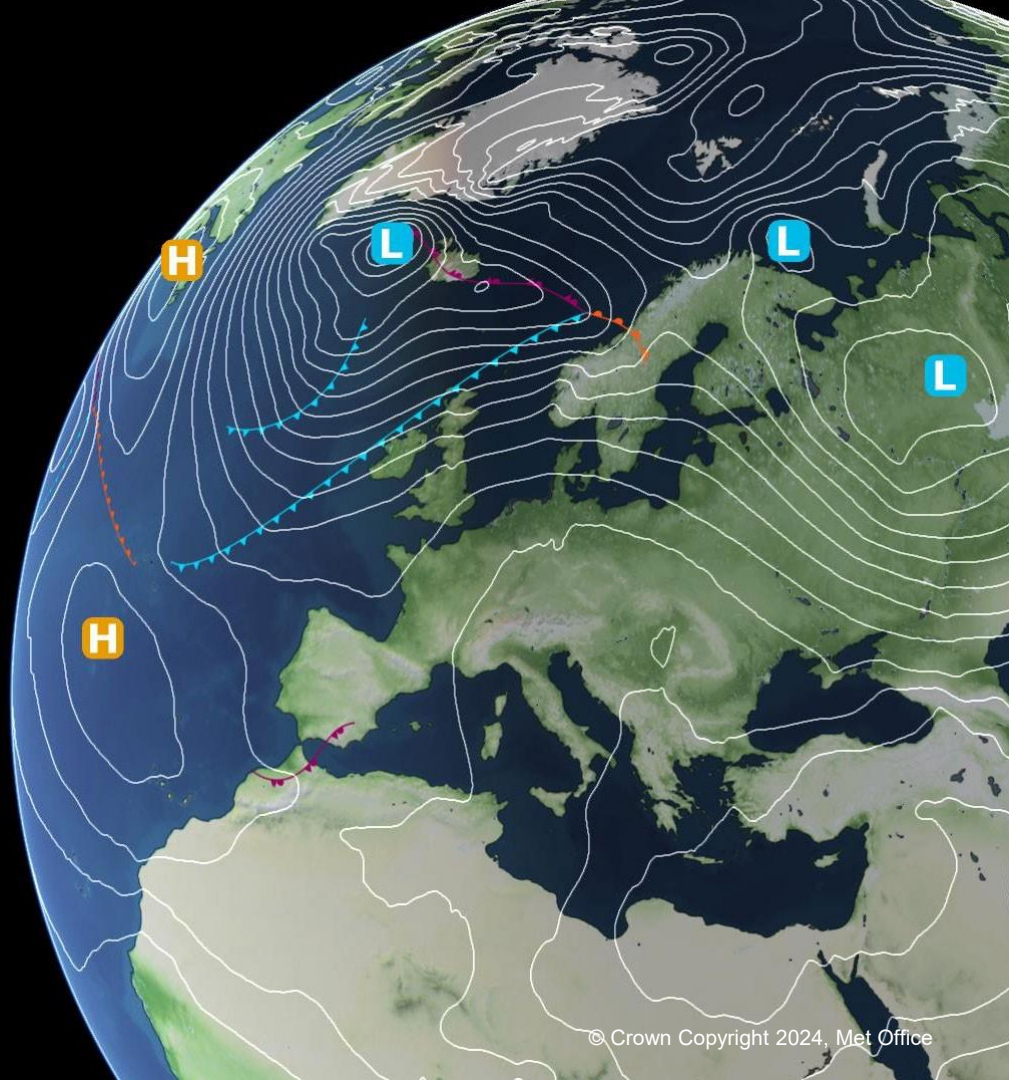
Thank you

colin.taylor@bristol.ac.uk

Key points in current climate science for mitigation and adaptation

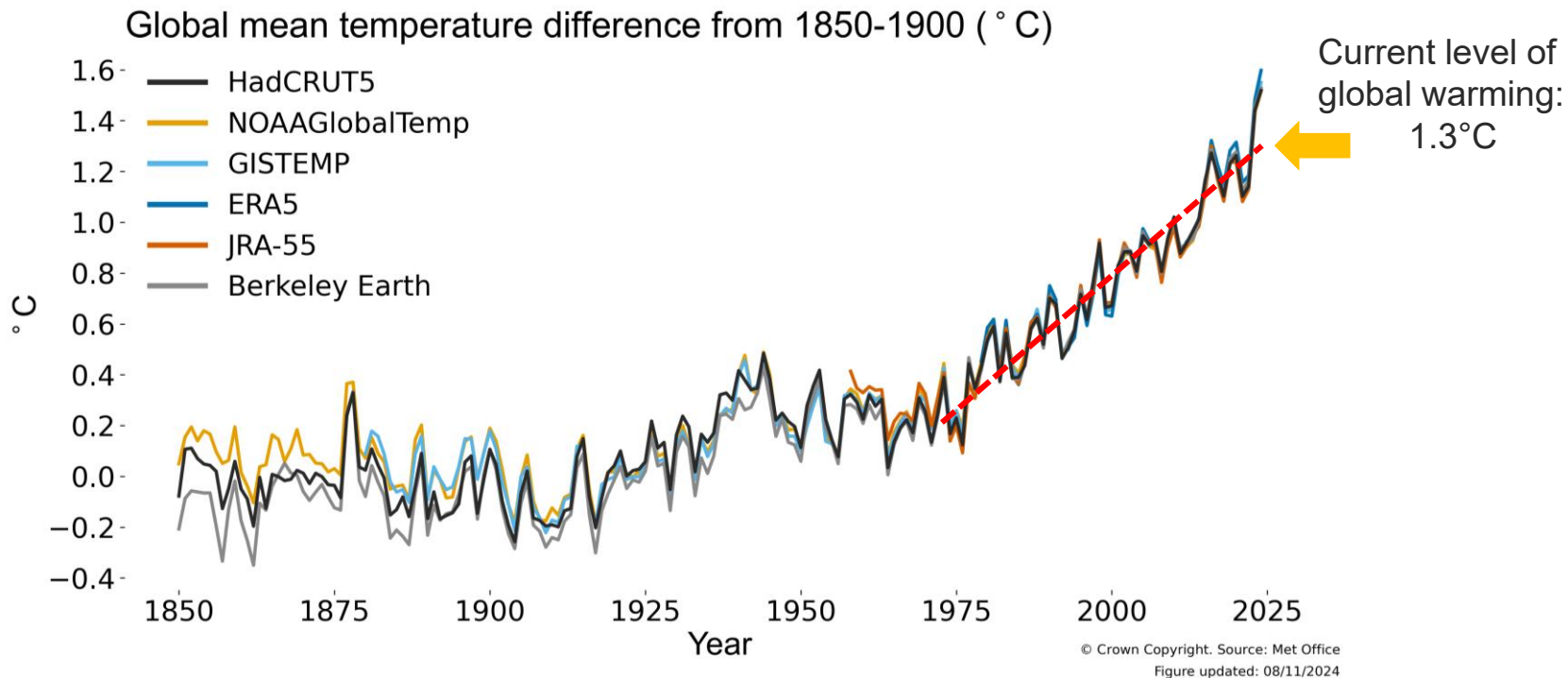
Prof Richard Betts MBE

South West Infrastructure Partnership
Bristol, 20th November 2024



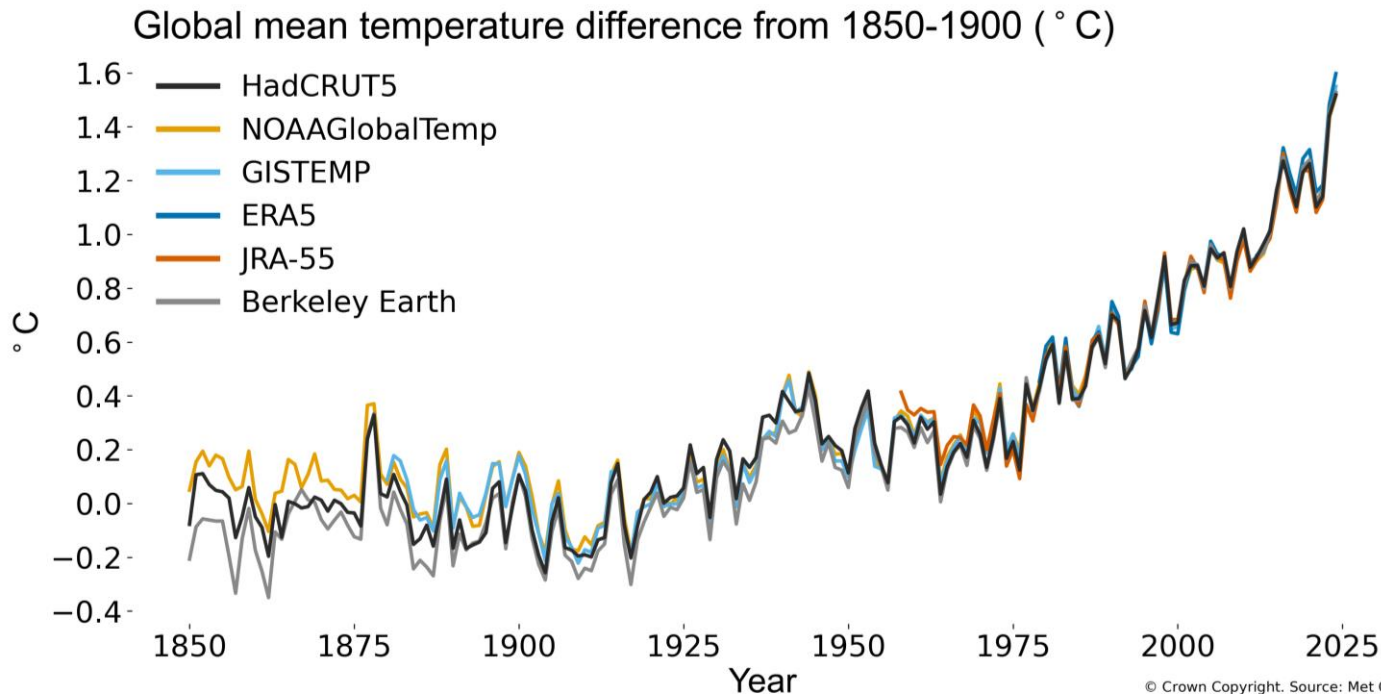
2024 will be the first year at “+1.5°C”, but this does not mean the Paris Agreement lower limit has been breached

1.5°C global warming refers to the long-term trend

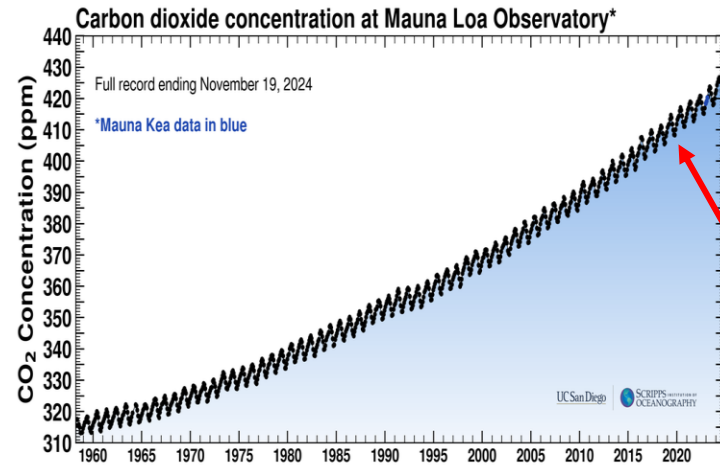
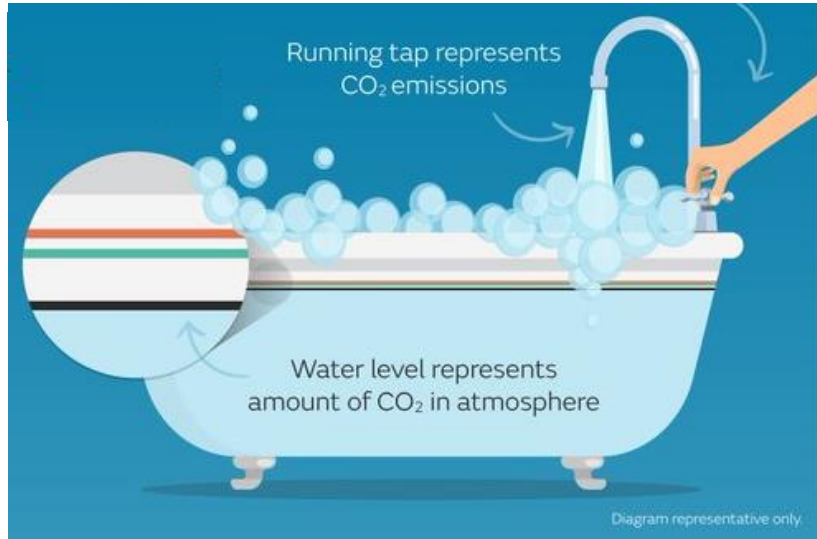


1.5°C warming is not a fundamental physical threshold

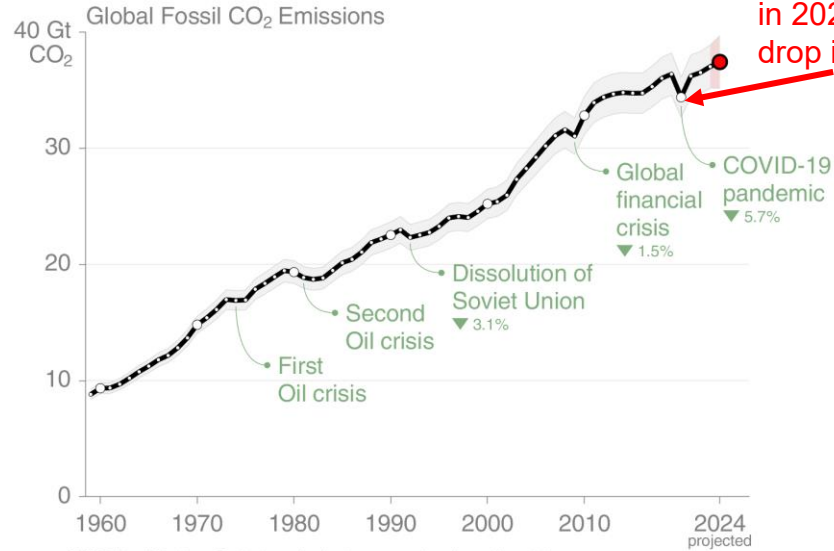
So exceeding this level in 2024, or a longer period, will not mean “game over”
Still worth cutting emissions to limit warming to as little above 1.5C as possible



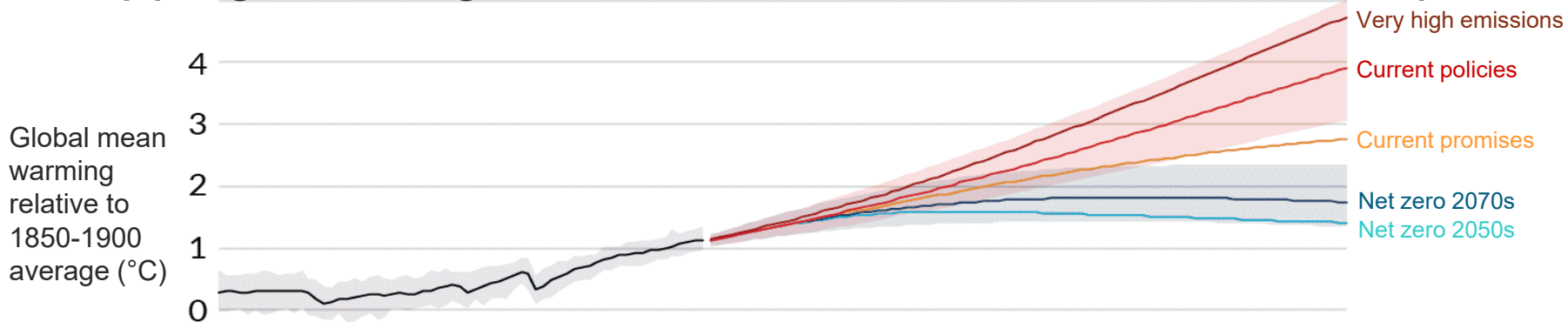
Reducing emissions does not immediately halt or reverse global warming
- need to *stop* emissions completely (or remove as much as is being emitted, ie “net zero”)



CO₂ in the atmosphere continued to rise in 2020 despite drop in emissions

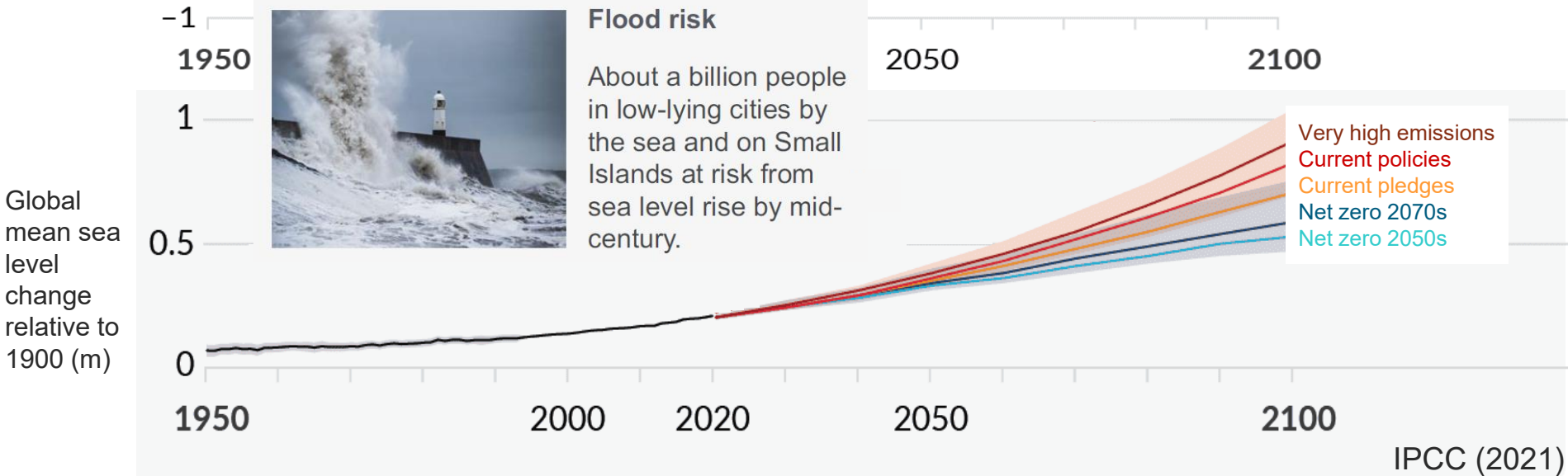


Stopping warming does not mean sea level rise also stops



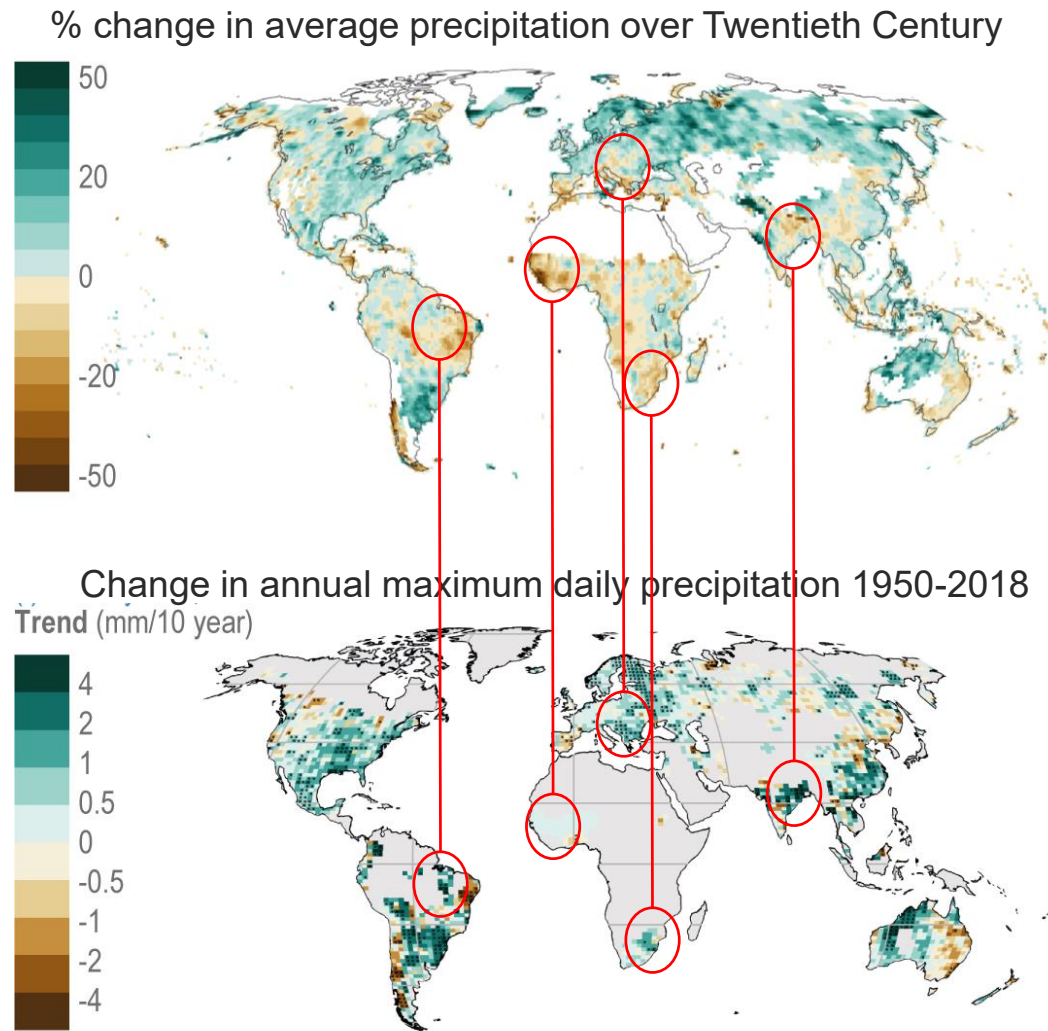
Flood risk

About a billion people in low-lying cities by the sea and on Small Islands at risk from sea level rise by mid-century.



It is possible to get increasing risk of both droughts and floods in the same place

Heavy rainfall can increase even where average rainfall is decreasing



Summary

A single year at +1.5°C does not mean long-term warming has reached that level

- 2024 will be the first year at 1.5°C above 1850-1900, but long-term warming is 1.3°C

1.5°C is not a fundamental physical threshold

- global warming does not suddenly become irreversible at this point

- so it is still worth reducing emissions to avoid further warming

But merely reducing emissions is not enough to stop temperatures rising

- emissions need to reach (net) zero so that CO₂ ceases to build up in the atmosphere

- this emphasises the urgency of both reducing emissions and adapting to ongoing change

Even if temperatures stabilised, sea level rise would still continue to some extent

- some level of further adaptation will therefore be needed

- but the higher the stabilised temperature, the greater the long-term sea level rise

- again this emphasises the urgency of bringing emissions to (net) zero

Both drought and flood risk can increase in the same place

- longer periods without rain, but when it rains, it rains harder

Q&A

Please put your hand up to ask a question



Breakout Session 1:

**Exploring the diversity of end user
perspectives and needs**

Breakout session 1: The diversity of end users & their needs (40 mins)

Part A: Thinking about the diversity of end users and their needs (20 mins)

Discuss the generalities of the diversity of end user needs and outcomes and how they can be accommodated. Draw on your personal and professional experiences and perspectives.

Part B Thinking about a specific end user – deeper dive (20 mins)

Who is the person? Where do they live? What are their needs?

What is their background? Worldview? Opinions?

When and how they can best be engaged with by a climate adaptation project?





Reflections on end user perspectives across multiple sectors

Dame Janet Trotter DBE CVO

Great Western Railway Advisory Board Member

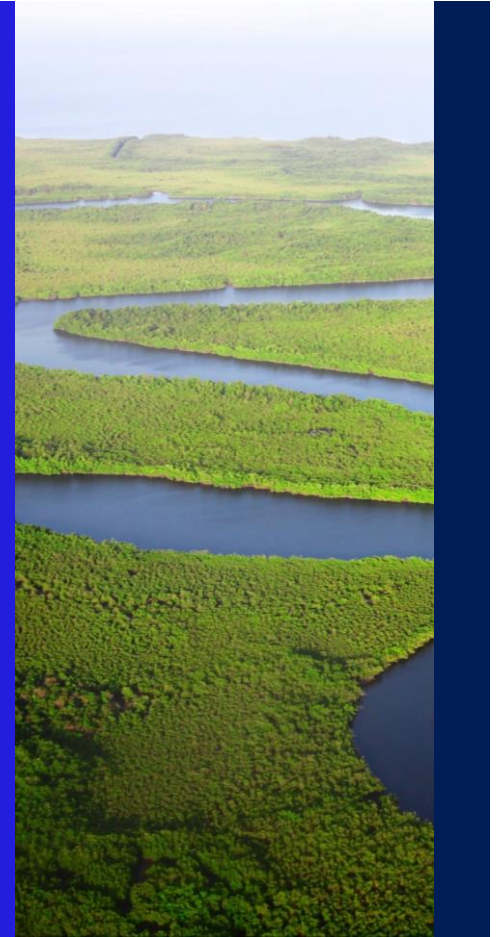
South West Infrastructure Partnership

Adaptation Pathways Workshop 3: The end user perspective

Engineers House Conference Venue, 20 November 2024

Applying Adaptation Pathways – some end user perspectives

Peter von Lany CEng FICE
Director, Climate Change Adaptation



Summary

- Adaptation Pathways (APs) support adaptation decision-making
- APs and end users
- Emerging insights from on-going work
- Broader insights

Decisions on adaptation

Adaptation decisions need to take a *long view* and consider:

- *Deep uncertainties* associated with climate change
- Impacts of climate change that are *dynamic, complex, and potentially unstable*— influenced by changes in social and economic systems, the environment, technology and innovation

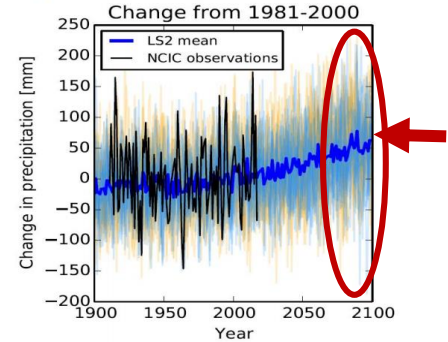
- Good adaptation decisions need to underpin programmes and projects with long working-lives:
 - Need to allow for change and uncertainty in *design concepts* and *standards*
 - Over(or under)-investment in resilience can cause *regret*
 - Poor choices can lead to *tipping-points; lock-in* to maladaptation; and/or *high transfer/recovery costs*

Future UK precipitation

- Winter precipitation is expected to increase significantly
- Summer rainfall is expect to decrease significantly
 - But when it rains in summer there may be more intense storms

Source: UKCP18

England mean winter precipitation



We will still get some dry winters, but wet winters will become wetter



www.metoffice.gov.uk

Working together on
UK Climate Projections

© Crown Copyright 2018, Met Office

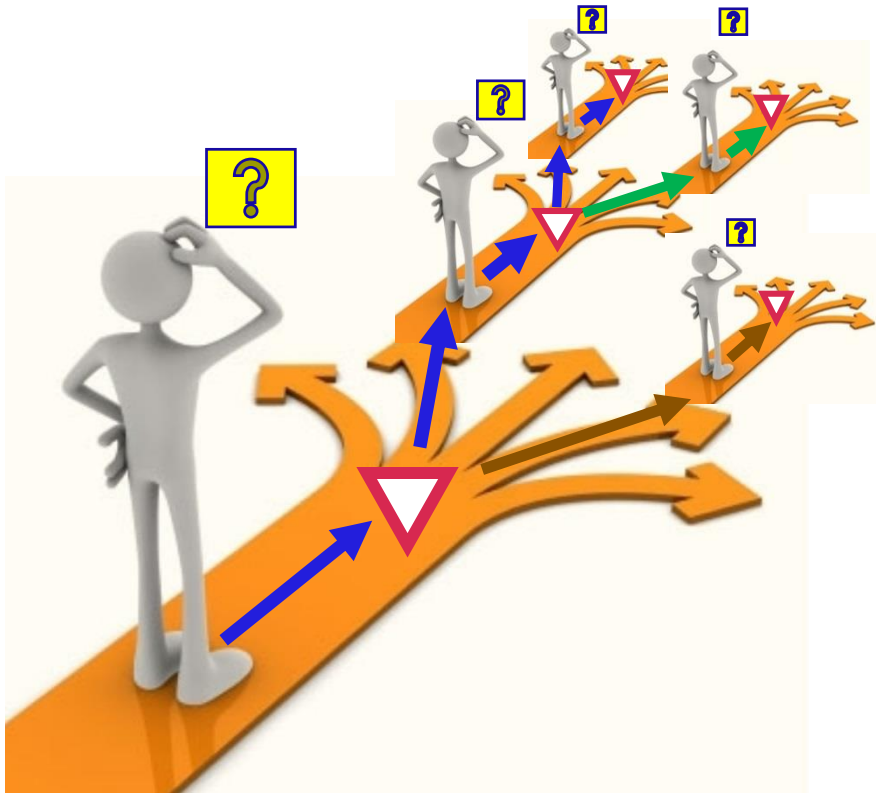
Adaptive planning process

- An iterative process, **involving end-users** incorporating learning via feed-back
- Applies information on change and uncertainty to:
 - identify risk/opportunity thresholds
 - assesses future decision-points
 - evaluate adaptation responses
 - plan sequences of adaptation actions
 - monitor change and outcomes
- Provides a planning and decision framework within which adaptation pathways can applied



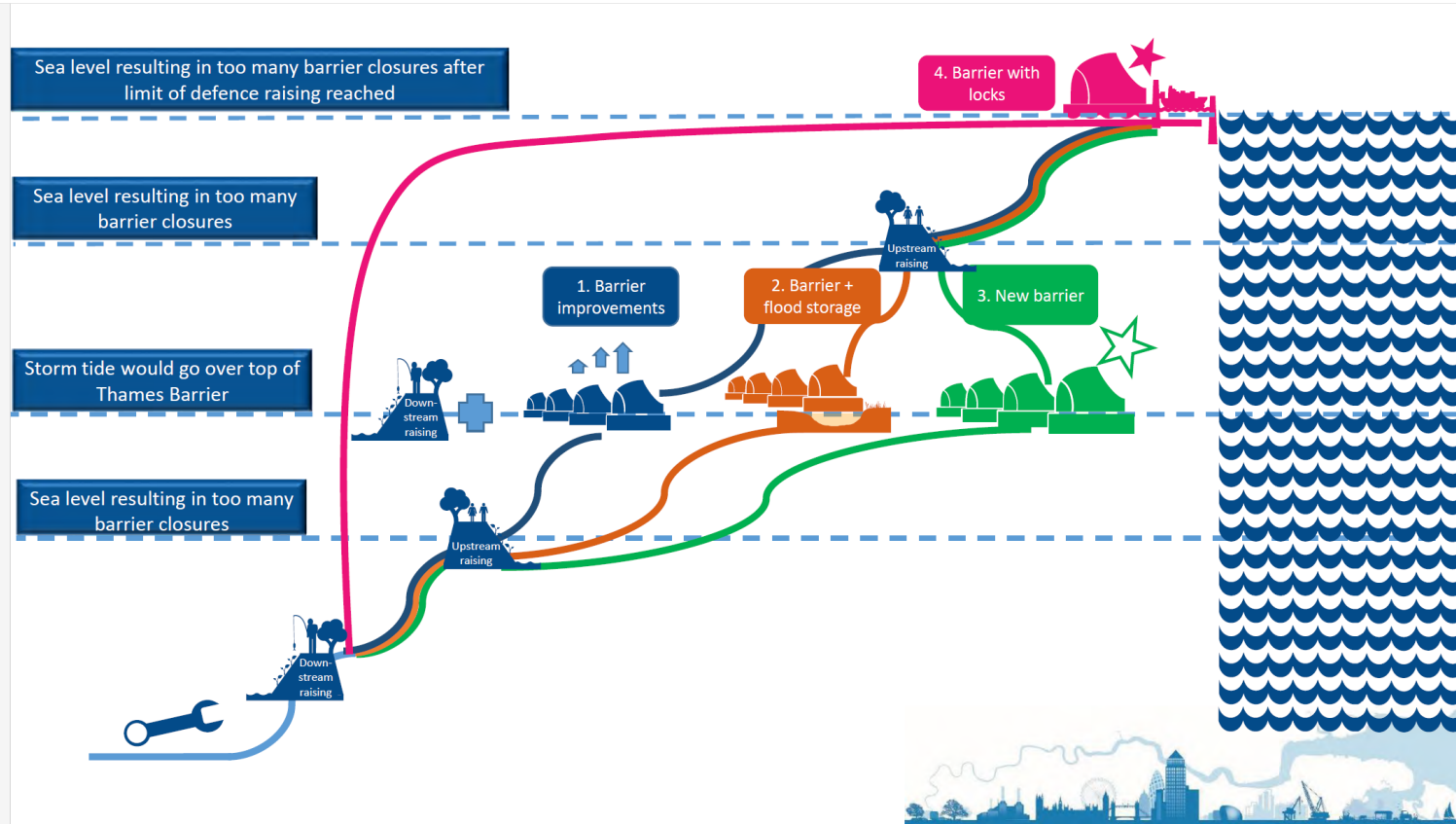
Source: River Severn Adaptation Study, 2021

Adaptation pathways (APs)



- Coherent sequences of adaptation actions to maintain the performance of systems and/or implement policy responses to change and extreme events in the face of uncertainty
- Ideally, *robust* sequences of adaptation actions, with potential to perform well across a range of future scenarios
- Approaching *risk/opportunity thresholds* signal the need to act to:
 - improve resilience and adaptive capacity
 - unlock opportunities
 - avoid or prepare for tipping-points
 - avoid *lock-in* to *mal-adaptation*
- Adaptation can range from *autonomous* and *incremental* actions to *planned* and *transformational* actions

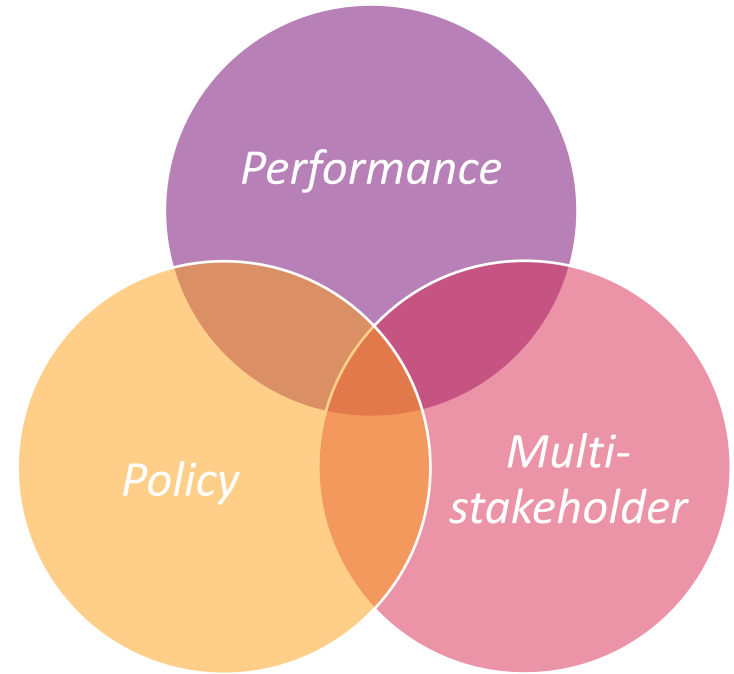
TE2100 – a route map for *performance -led* flood risk management



Source: Environment Agency, London Climate Change Partnership, Thames Estuary Partnership

Forms of adaptation pathways

- *Performance-led: predict and act* adaptation actions to meet specific targets (e.g. not crossing agreed flood risk thresholds)
- *Policy-led: imagine and plan* adaptation policies directed towards alternative long-term 'destinations', some requiring *transformational* adaptation
- *Multi-stakeholder*: pathways within and across organisations, *promoting collaboration* in developing adaptive capacity



Source: *Adaptation pathways: A review of approaches and a learning framework* Saskia E. Werners, Russell M. Wise, James R.A. Butler, Edmond Totin, Katharine Vincent (2021) *Jnl Env Sci & Policy*

Users involved in adaptation planning

Users fall into different (overlapping) groups who:

- identify *adaptation challenges*
- make *decisions*
- are stakeholders in the decisions made - *end users* affected by adaptation actions

Planners and decision makers tend to use APs to help:

- make long-term decisions under uncertainty
- resolve trade-offs between alternative choices
- communicate choices and rationale behind decisions taken

End users (stakeholders) should, ideally, participate in AP development by:

- identifying adaptation options
- articulating preferences and helping resolve trade-offs

Adaptation pathways help:

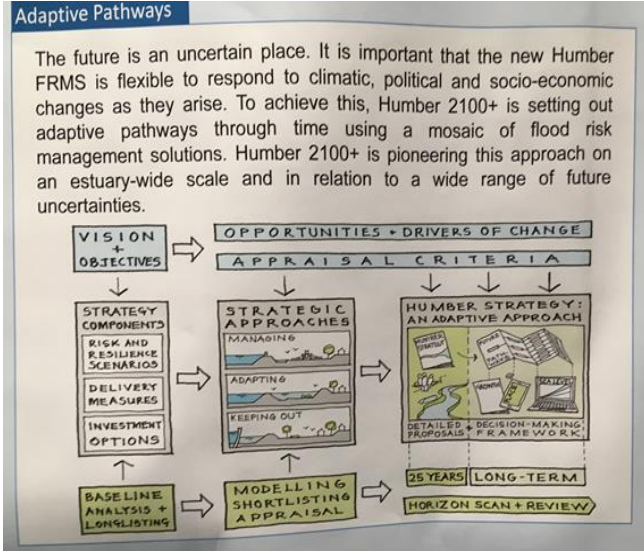
- structure decision-making
- communicate choices and outcomes

Emerging insights from on-going work on the Environment Agency Adaptation Pathways Pilot Programme (APPP) being carried out by Arup and Jacobs in the River Severn Region

Environment Agency APPP

A five year Defra/Environment Agency programme (2022 – 2027) to explore and test embedding **resilience** and **adaptation to climate change** within Flood and Coastal Erosion Risk Management (FCERM) projects

Source: <https://engagemenvironmentagency.uk.engagemthq.com/adaptation-pathway-programme>



THE GROWTH CORRIDOR

Cambridge and Oxford are two of the least affordable places to live in the United Kingdom, with house prices double the national average.

The Cambridge - Milton Keynes - Oxford corridor is home to **3.3m people** and some of the most productive, successful and fast-growing cities in the United Kingdom.

The Commission's central finding is that a lack of sufficient and suitable housing presents a fundamental risk to the success of the area. Without a joined-up plan for housing, jobs and infrastructure across the corridor, it will be left behind by its international competitors. By providing the foundations for such a strategy, new east-west transport links present a once in-a-generation opportunity to secure the area's future success.

Governance
Local authorities, Local Enterprise Partnerships, government departments and national delivery agencies should work together to develop proposals for the joint governance arrangements required to deliver infrastructure and housing.

Rail
Government should commit to delivering the Western Section of the East West Rail project before the end of 2024, bringing forward £100m of funding to avoid delay, and commit up to £10m in development funding to continue work on the Central Section.

Road
Government should commit to £27m to the end of 2018/19 to fund the next phase of work on the Oxford-Cambridge Expressway study.



Severn 2100+ APPP

AP application initially focuses on flood risk management but will broaden to include land-use and water systems planning using a process that:

- is **iterative**
- **inclusive**: involving *decision-makers* and *end-users*
- **scalable**: from location → focus area (catchment) → region
- **flexible**: considers future scenarios to help address uncertainty
- identifies key '*enablers*' on which effective adaptation actions depend

Decision-makers include:

- Environment Agency (EA)
- River Severn Partnership (EA, local authorities, water utilities, conservation organisations ..)

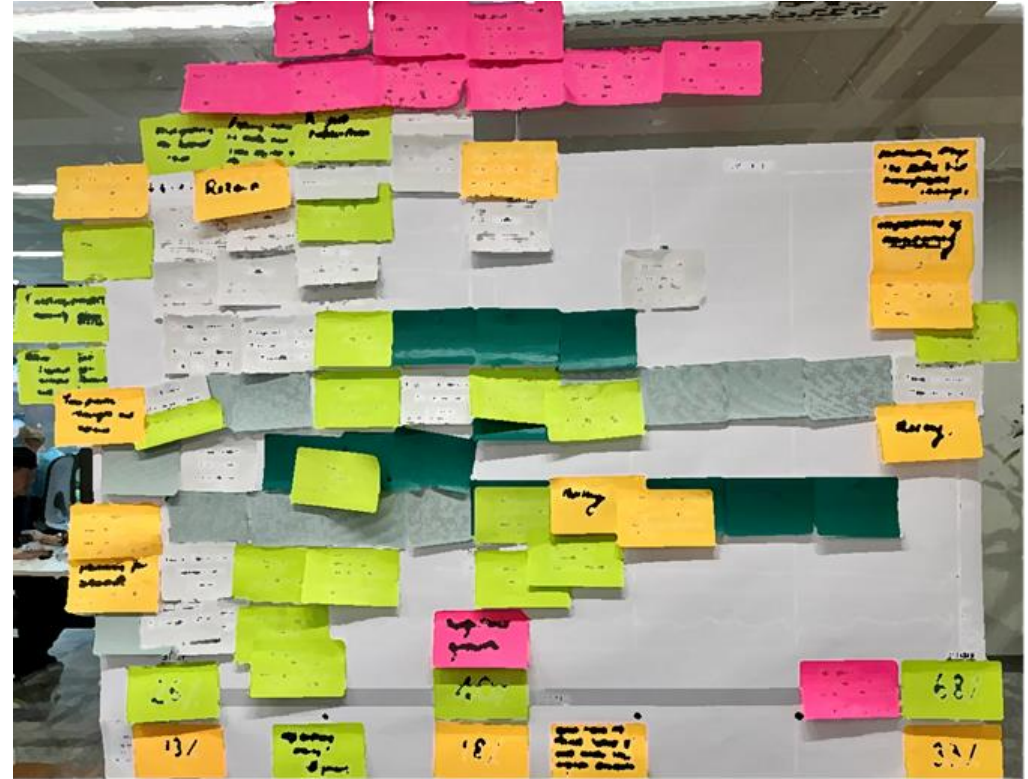
Stakeholders (end users) include:

- those living in the River Severn Region

Clarity in communicating the purpose, concept, application, and limitations, of APs is crucial to their success!

Collaboration with users

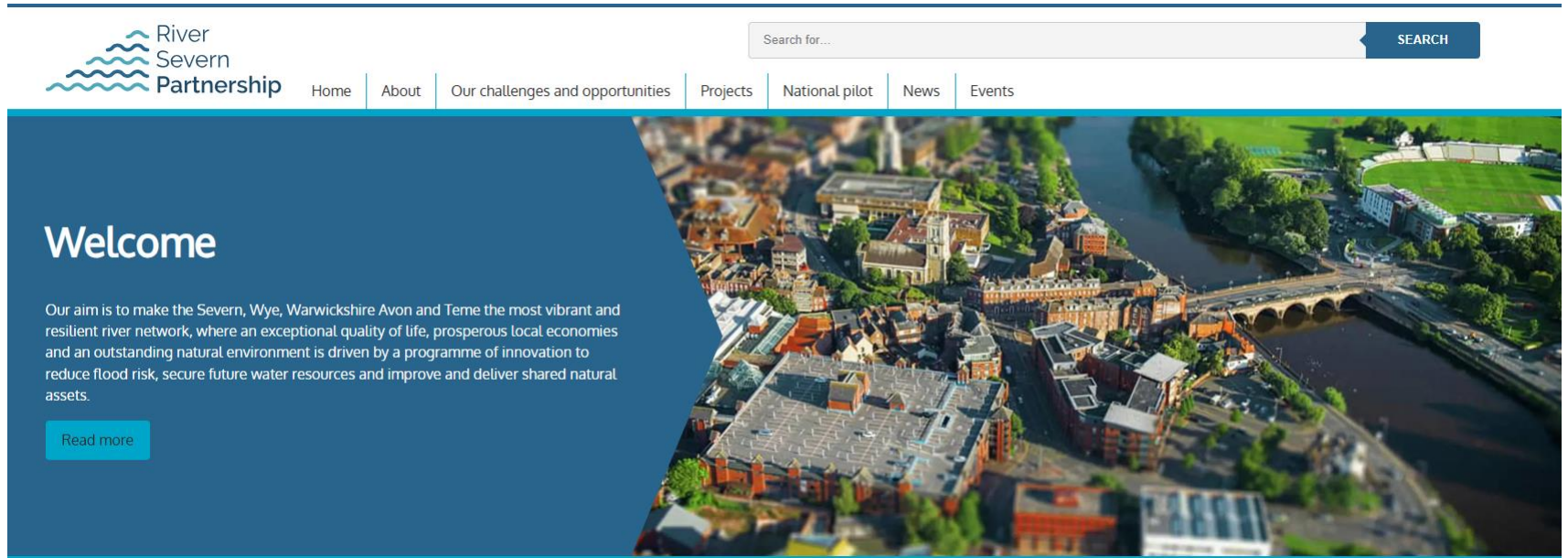
- Co-development of *high-level* Adaptation Pathways with **decision-makers** considering different policy-lenses and future scenarios – these are a first step towards developing a set of preliminary APs
- Citizen Panels, involving 20 participants drawn from the River Severn catchment, met for a series of sessions to help explore **end-user** reactions to adapting the Severn river system to climate change



“With more extreme weather events, how can we jointly create a great future for the River Severn and its joining rivers?”

Next steps

- Finalise developing first iteration APs with Environment Agency (as primary user / decision maker)
- Then, extend APs to help develop a broader climate resilience strategy for the River Severn region
- Collaborate with end-users via workshops involving the River Severn Partnership - <https://www.riversevernpartnership.org.uk/>



Broader insights

Examples of broader insight

- *Adapting the Somerset Levels* has developed an online adaptation pathways tool where end-users can explore/adjust/review adaptation options – see <https://pathways.adaptingthelevels.com/about/get-involved>
- UK Climate Resilience Programme (UKCRP) – see <https://www.ukclimateresilience.org/> has found that:
 - Effective delivery depends on positive enabling conditions
 - User trust is critical
 - Scaling up from a single themed climate challenge to multiple interactive challenges increases in complexity!

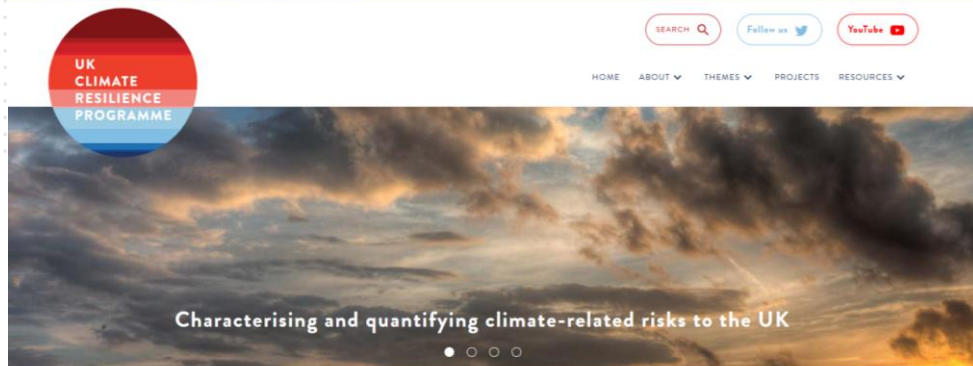
Take action on Climate Adaptation

Welcome to the Adaptation Pathways Tool!

Adaptation Pathways are a new form of preparing for the climate emergency. They allow effective plans to be created even in the face of uncertain climate impacts.

This online tool enables people to comment, edit and add to the pathways,

The UK Climate Resilience Programme ran from 2019 to 2023



The UK Climate Resilience Programme

The UK Climate Resilience Programme was a four-year Strategic Priorities Fund (SPF) interdisciplinary research programme led jointly by UK Research and Innovation (UKRI) and the Met Office, and under the direction of Co-Champions Suraje Dessai and Kate Lonsdale (University of Leeds), and Jason Lowe (Met Office). Meet the Champion Team [here](#).

Setting standards and raising awareness ...

- **ISO14090:2019** – *adapting to climate change*
- **BS 8631:2021** – *adaptation pathways*
- **CCRA3 (2021)** – *Climate Change Risk Assessment every five years setting out climate change risks and opportunities facing the UK*
- **CCC 2023 progress report to Parliament (2023)**– *draws attention to scale and ambition in implementing adaptation in the UK*
- **Network Rail Adaptation Report** – *provides practical guidance on adaptation within the rail network*
- **Third National Adaptation Programme (2024)** – *UK Government’s adaptation policy*



ISO 14090:2019

Adaptation au
changement climatique

BS 8631:2021



BSI Standards Publication

Adaptation to climate change — Using adaptation pathways for decision making — Guide

bsi.

Policy paper
Understanding climate adaptation and the third National Adaptation Programme (NAP3)
Updated 21 February 2024

This was published under the 2022 to 2024 Sunak Conservative government



- Contents
- Climate change
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 - Climate risks and opportunities
 - The government’s role in climate adaptation
 - Devolved governments
 - The role of local government, businesses and the public
 - Learn more about climate adaptation

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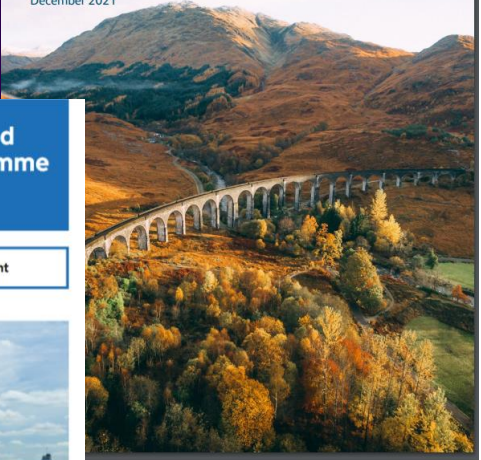


March 2023

Progress in adapting to
climate change
2023 Report to Parliament



**Network Rail
Third Adaptation
Report**
December 2021



Thank you!

peter.vonlany@jacobs.com

Jacobs

Challenging today.
Reinventing tomorrow.



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Q&A

Please put your hand up to ask a question



Breakout Session 2:

How do we meet the diversity of end user needs?

Breakout session 2: How do we meet the diversity of end user needs? (40 mins)

- What do we need to do to improve end user experiences, outcomes, and benefits?
- What do we already do well?
- What can't we do or need to improve?
- What do we need to learn?

Rounding-up plenary session: What would you do differently and what should SWIP do next?

1. What would you do differently with regards to the end user in your climate adaptation work?
2. What might SWIP do next on this topic?





How can SWIP support you to develop your own approach?

Professor Colin Taylor

Emeritus professor, University of Bristol & SWIP steering group member



Closing remarks

Miranda Housden

Regional Director, ICE South West

Save the date



11 June 2025
Professor Jim Hall
ICE President
SWIP conference



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Beyond Brunel - Series 3, Episode 1
Infrastructure for growth

Search for Beyond Brunel on Apple Podcasts or Spotify





Thank you for attending