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Adaptation Scotland

An Introduction: **Climate Change Adaptation**

13th February 2013

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**Adaptation
Scotland**
supporting **climate change** resilience

“Increase the resilience of organisations and infrastructure in Scotland to meet the challenges and opportunities presented by the impacts of climate change”

Adaptation Scotland Partnership:



Part One: An Introduction to Adaptation



change is constant

social

environmental

legal

climate

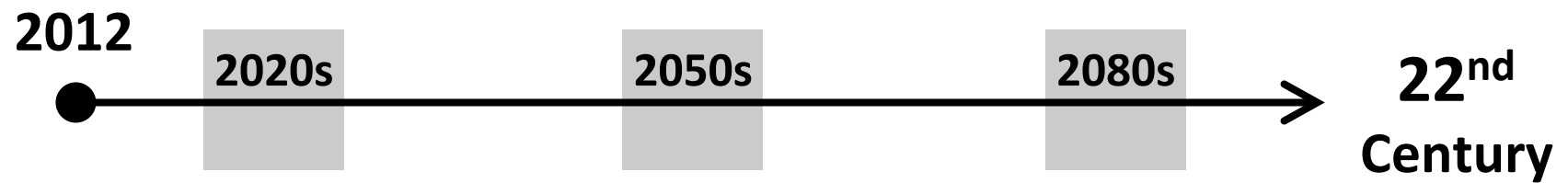
political

technological

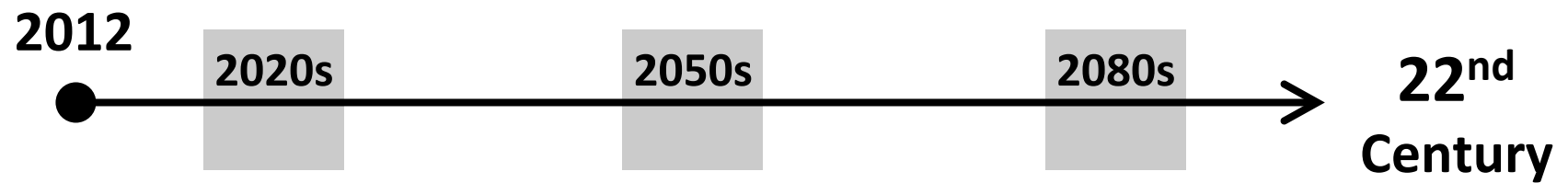
economic



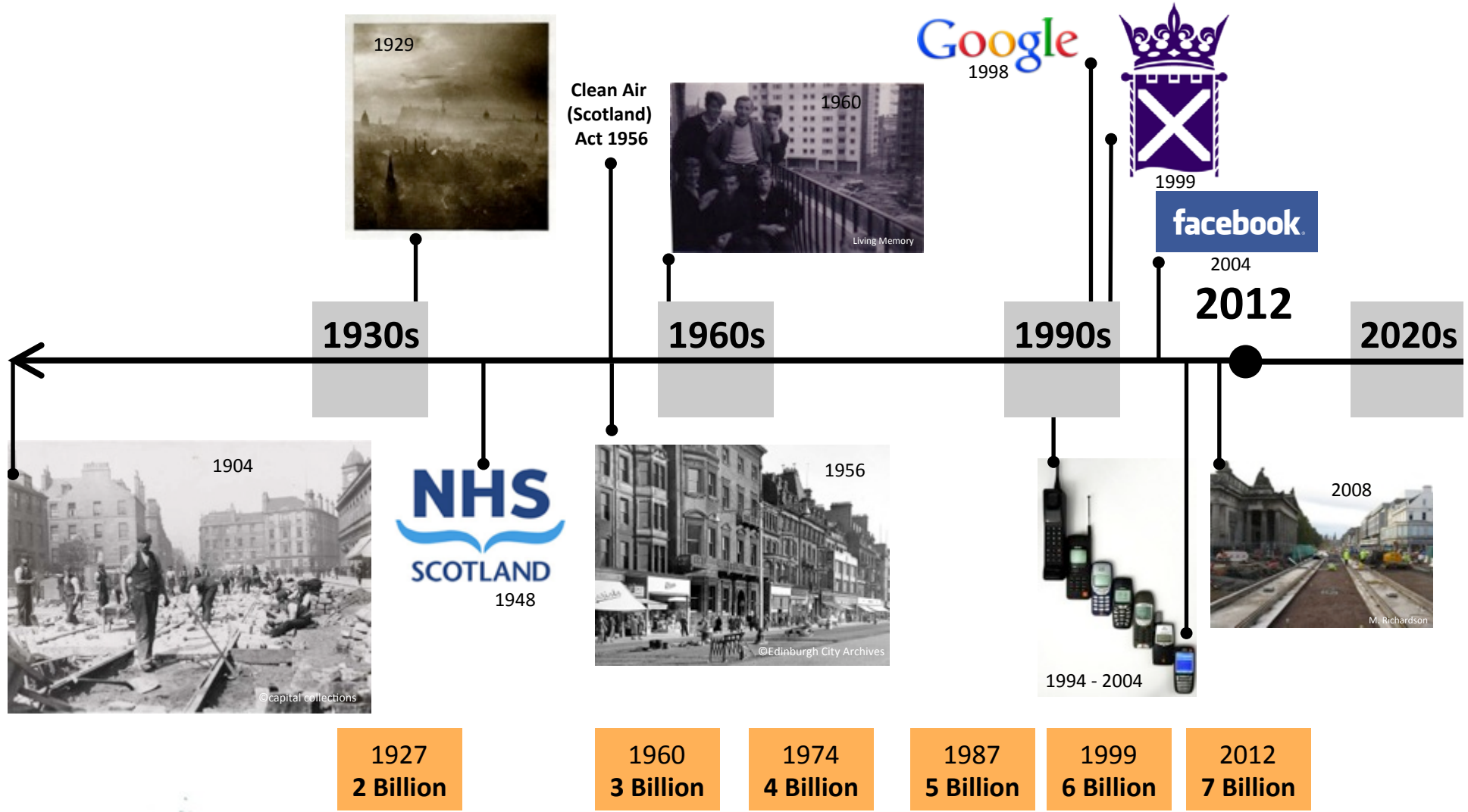
change is constant



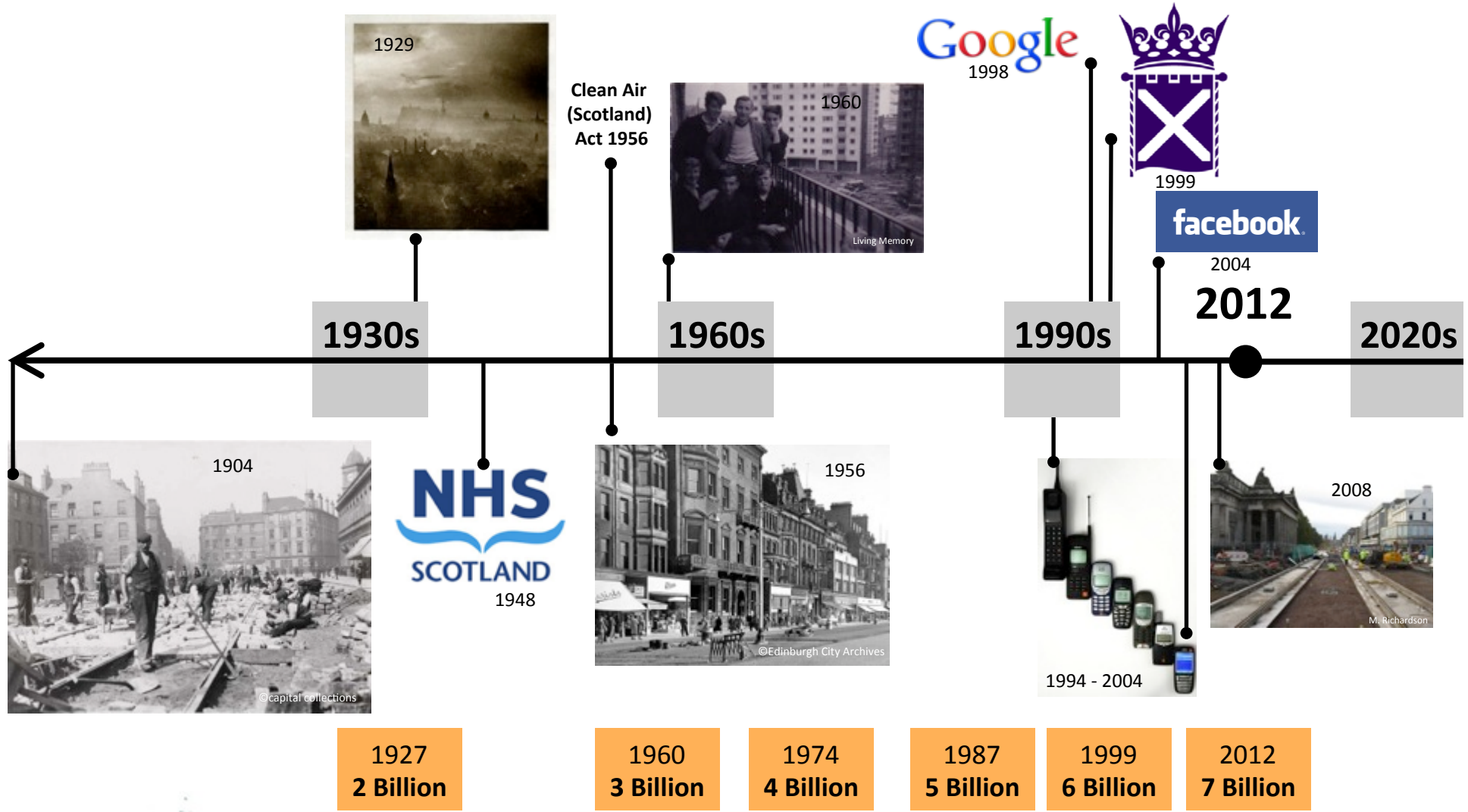
change is constant



change is constant



change is constant



Adaptation to Climate Change

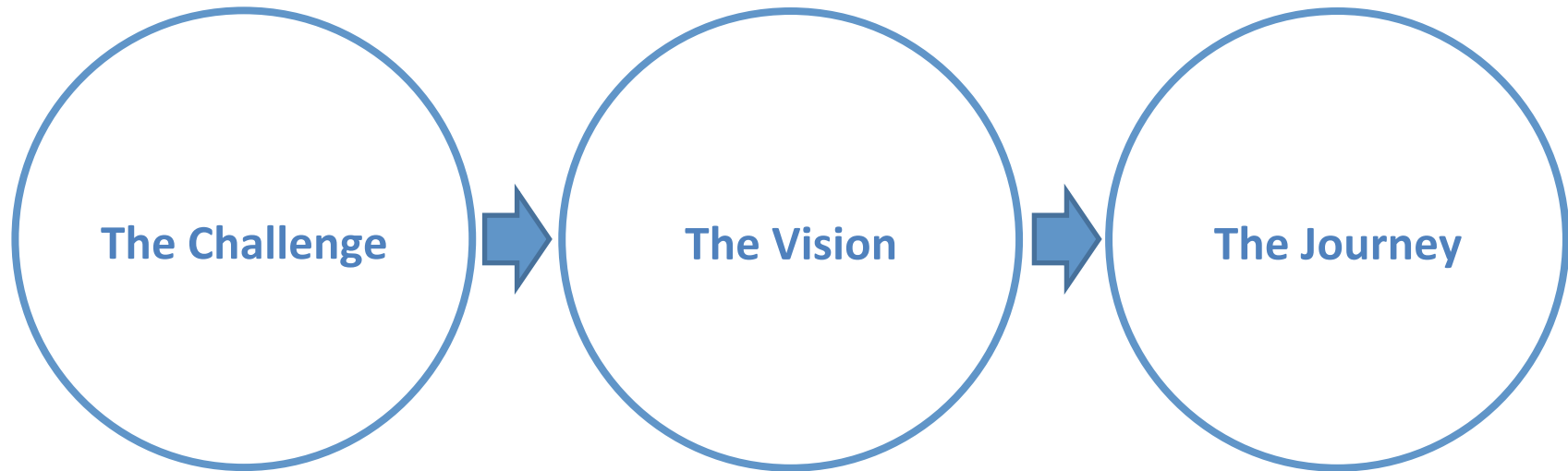
Adaptation: The adjustment in economic, social or natural systems in response to actual or expected climatic change, to limit harmful consequences and exploit beneficial opportunities.

Scotland's Climate Change Adaptation Framework (2009)

The **climate is changing** and we need to be ready...

... adaptation means we **prepare for the future** – to deal with threats and take advantage of opportunities.



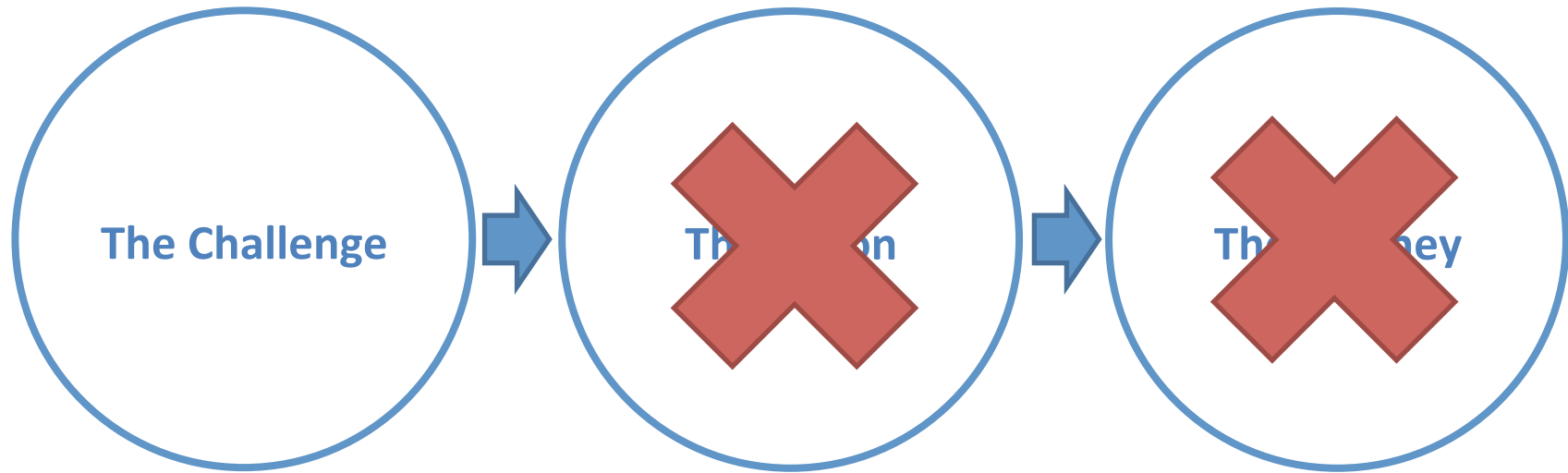


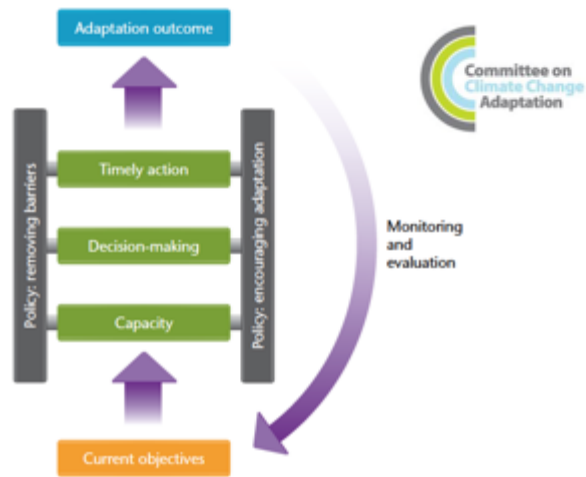
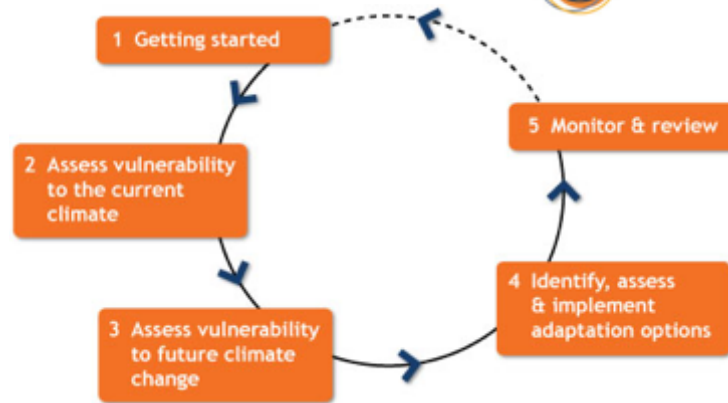
How will our climate change? What impact will this have on us?

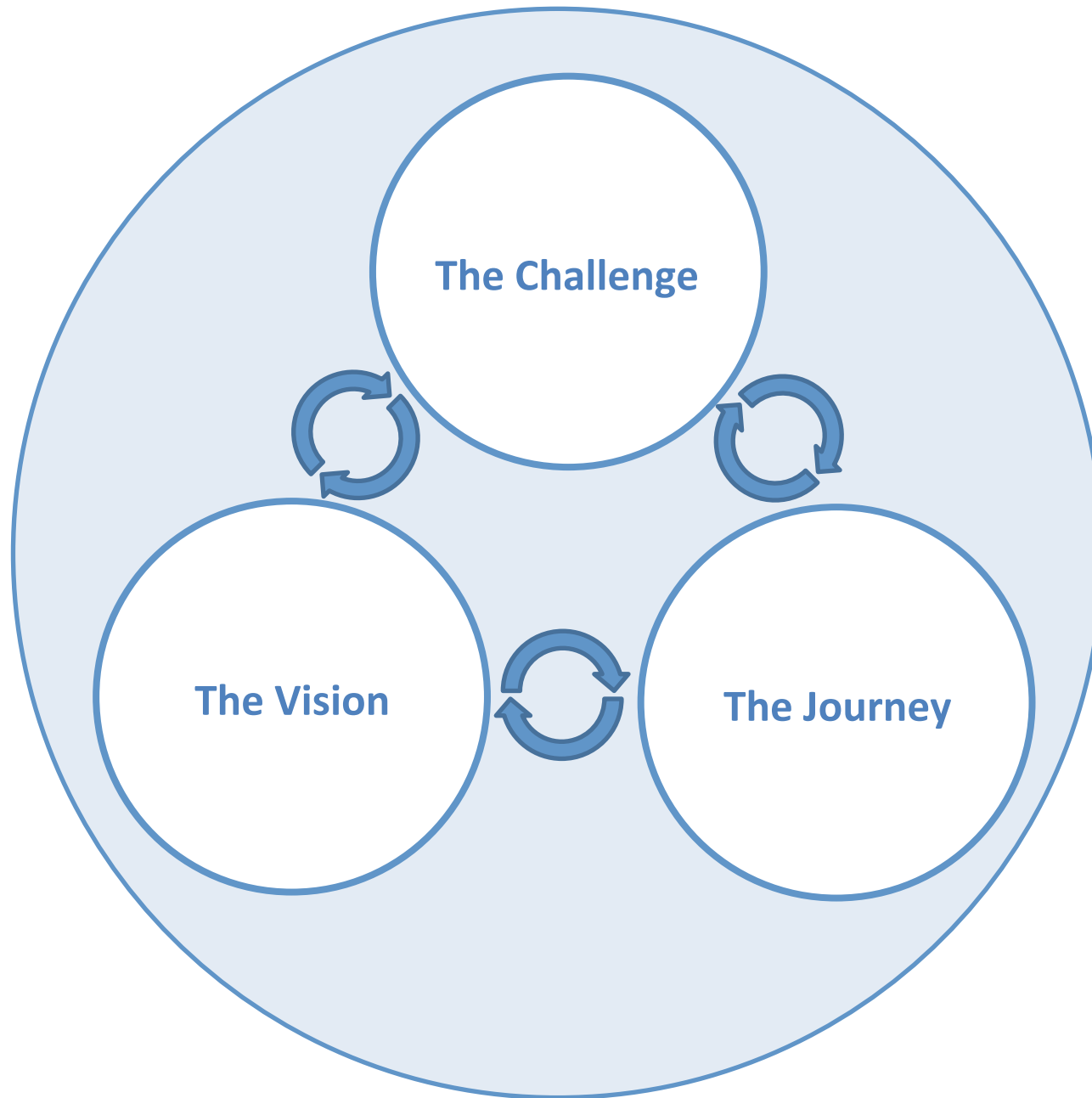
What would a climate ready place look like?

How do we get there?









The Challenge

How will our climate change? What impact will this have on us?

Climate Information:



Understanding Impacts:



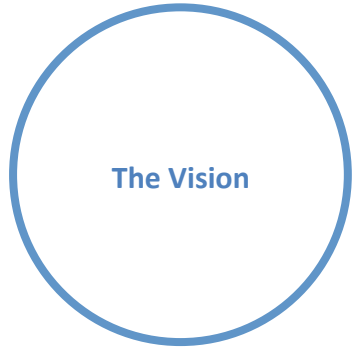
Risk Assessment:

Risk assessment examples - current and future risk

Hazard Type	Impact	Consequence	2010			2050			2070			2090		
			Current	Low	High	Current	Low	High	Current	Low	High	Current	Low	High
Severe weather event	Loss of buildings, personal property and businesses	Damage to coastal assets and buildings; Damage to residential property and businesses	3	4	5	2	3	4	3	4	5	3	4	5
Reduced summer rainfall	Water shortage during summer	Less rainfall results in a decrease in agriculture and utility industry productivity. Increased population due to climate benefit causes extra water pressure to maintain their water supplies. Droughts become more frequent	2	3	4	3	4	5	2	3	4	3	4	5
Hot waves/longer heat waves/heatwaves	Heat stress	Extreme drought stress on the land and plants, leading them 'to die' (especially in agriculture) which adds the speed and spread of forest fires which are a threat to life and property	3	4	5	3	4	5	3	4	5	3	4	5
Long term increase in precipitation	Landslides	Increased surface and water saturation makes the land overly saturated which leads to landslides in the dry regions	2	3	4	2	3	4	2	3	4	2	3	4

THE ADAPTATION GAP





What would a climate ready place look like?

Our Response to the Challenge:

What should we do???

Visions and Placemaking:



The Vision

TAYplan
The Strategic Development Planning Authority
for Dundee, Perth, Angus and North Fife

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Topic Paper 3: Resources and Climate Change

TAYplan Proposed Strategic Development Plan
2011

Dundee CHANGING FOR THE FUTURE
Fife

TAYplan
The Strategic Development Planning Authority
for Dundee, Perth, Angus and North Fife

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Topic Paper 4: Place Shaping

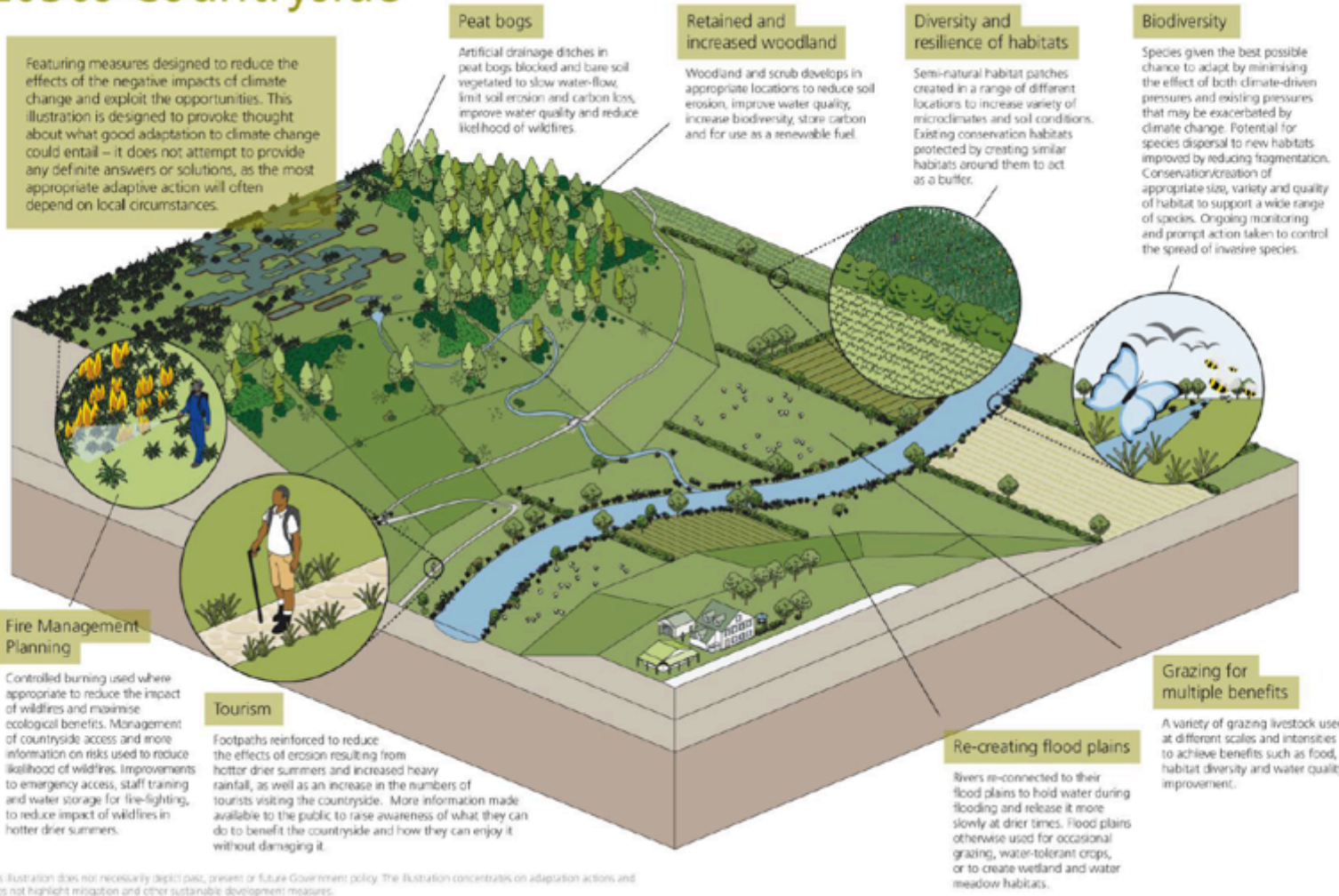
TAYplan Proposed Strategic Development Plan
2011

Dundee CHANGING FOR THE FUTURE
Fife



The Vision

2030s Countryside



The Vision

2030s Coastal



Incorporating features designed to reduce the effects of the negative impacts of climate change and exploit the opportunities. This illustration is designed to provoke thought about what good adaptation to climate change could entail – it does not attempt to provide any definite answers or solutions. To allow inclusion in the illustration some features are shown closer together than they might ideally be situated, for example the next round of wind farm developments will be far from the shore.

Increased tourism

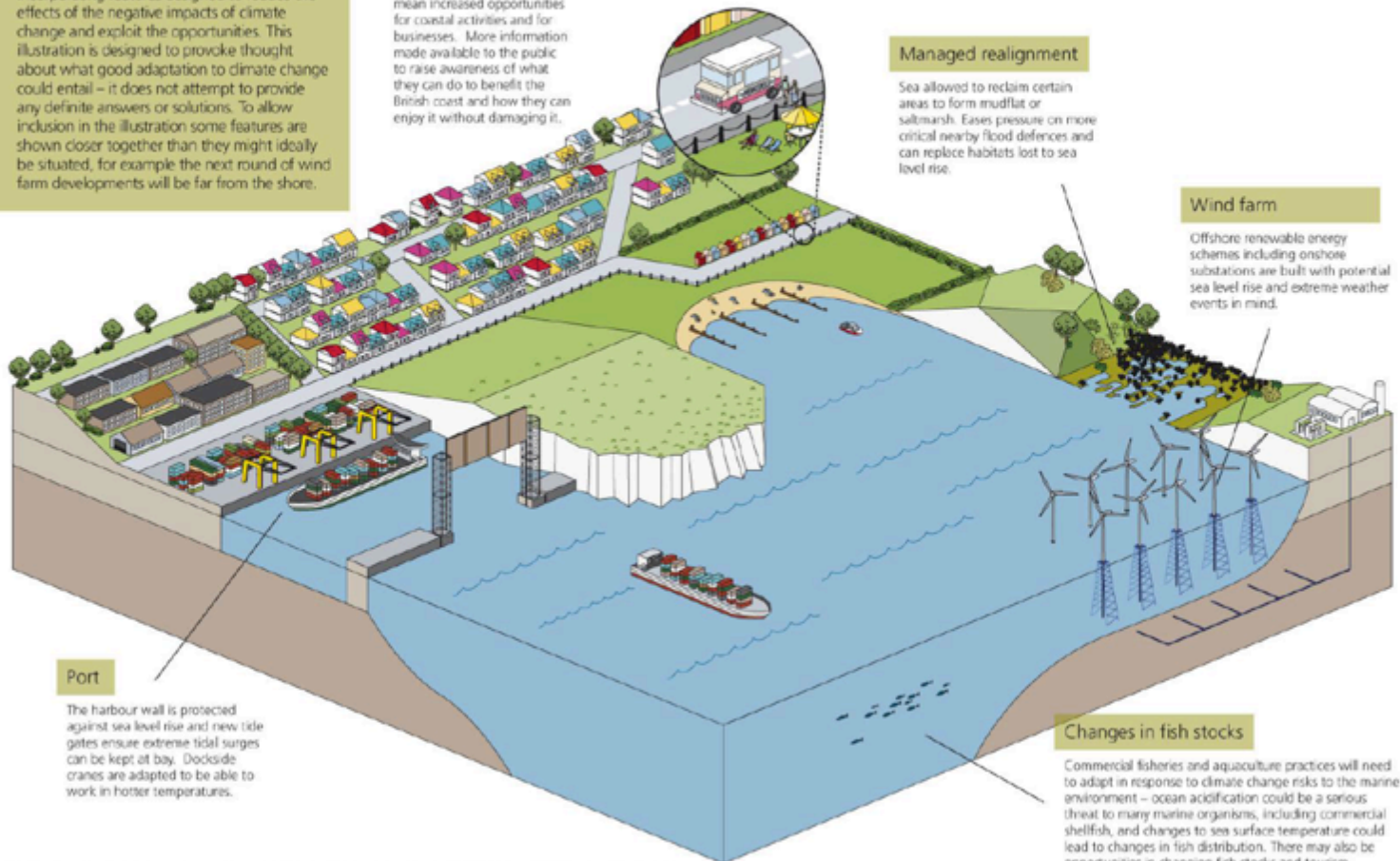
Warmer drier summers would mean increased opportunities for coastal activities and for businesses. More information made available to the public to raise awareness of what they can do to benefit the British coast and how they can enjoy it without damaging it.

Managed realignment

Sea allowed to reclaim certain areas to form mudflat or saltmarsh. Eases pressure on more critical nearby flood defences and can replace habitats lost to sea level rise.

Wind farm

Offshore renewable energy schemes including onshore substations are built with potential sea level rise and extreme weather events in mind.



Port

The harbour wall is protected against sea level rise and new tide gates ensure extreme tidal surges can be kept at bay. Dockside cranes are adapted to be able to work in hotter temperatures.

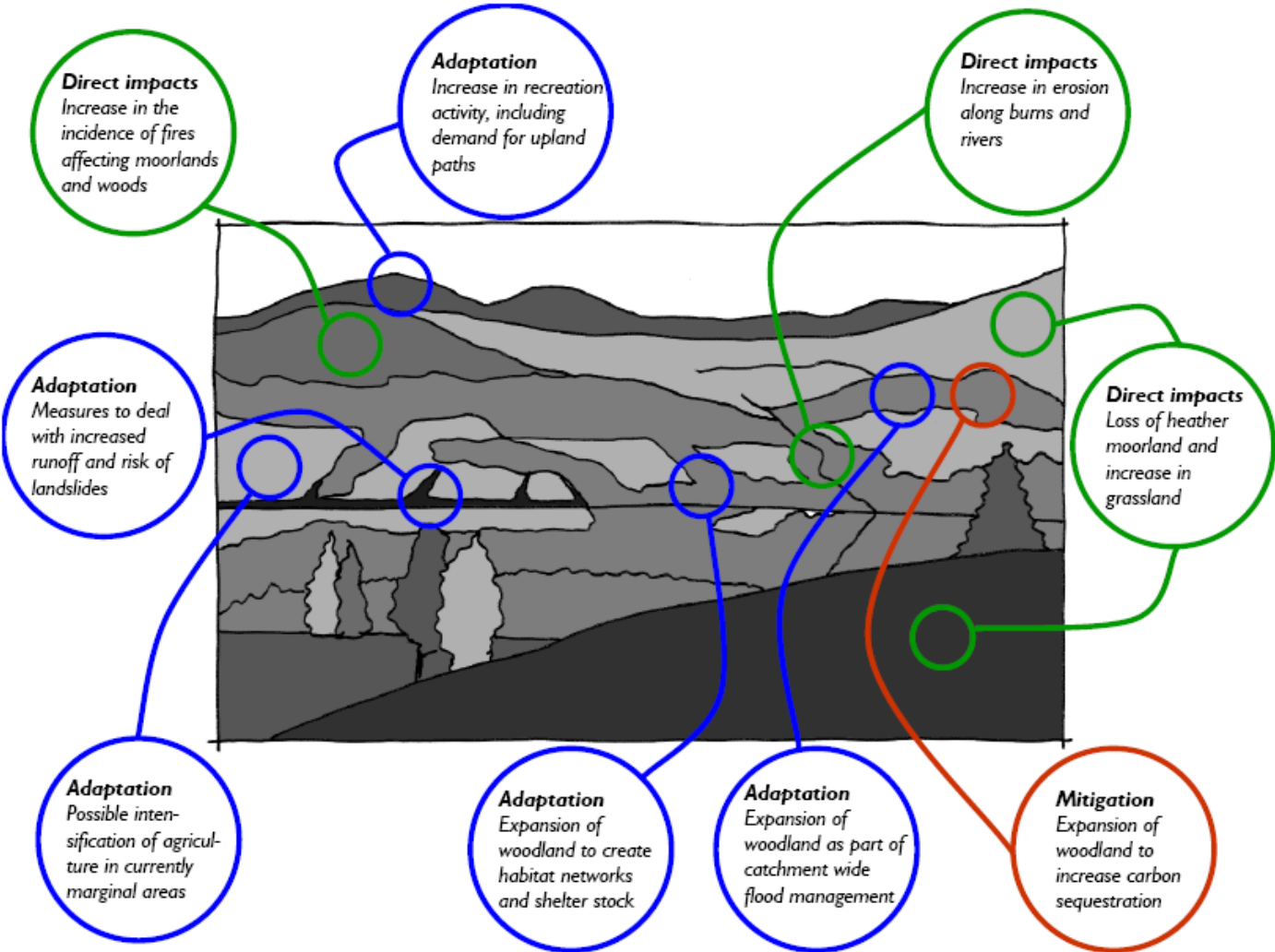
Changes in fish stocks

Commercial fisheries and aquaculture practices will need to adapt in response to climate change risks to the marine environment – ocean acidification could be a serious threat to many marine organisms, including commercial shellfish, and changes to sea surface temperature could lead to changes in fish distribution. There may also be opportunities in changing fish stocks and tourism.

This illustration does not necessarily depict past, present or future Government policy. The illustration concentrates on adaptation actions and does not highlight mitigation and other sustainable development measures. Traditional responses to flood and coastal erosion management may not always be the most sustainable or affordable. Defra is currently investigating this with the Coastal Change Pathfinder Programme.



The Vision



The Vision

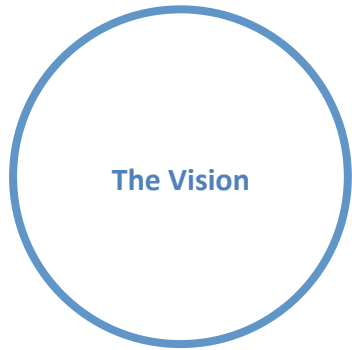


Original image: SNH (Lorne Gill)
Photo-edited by Land Use Consultants

The Vision



Original image: SNH (Lorne Gill)
Photo-edited by Land Use Consultants



The Vision

What would a climate ready place look like?

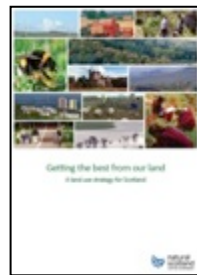
Our Response to the Challenge:

What should we do???

Visions and Placemaking:



Link to Other Priorities:





How do we realise the vision? What is the role of planning?

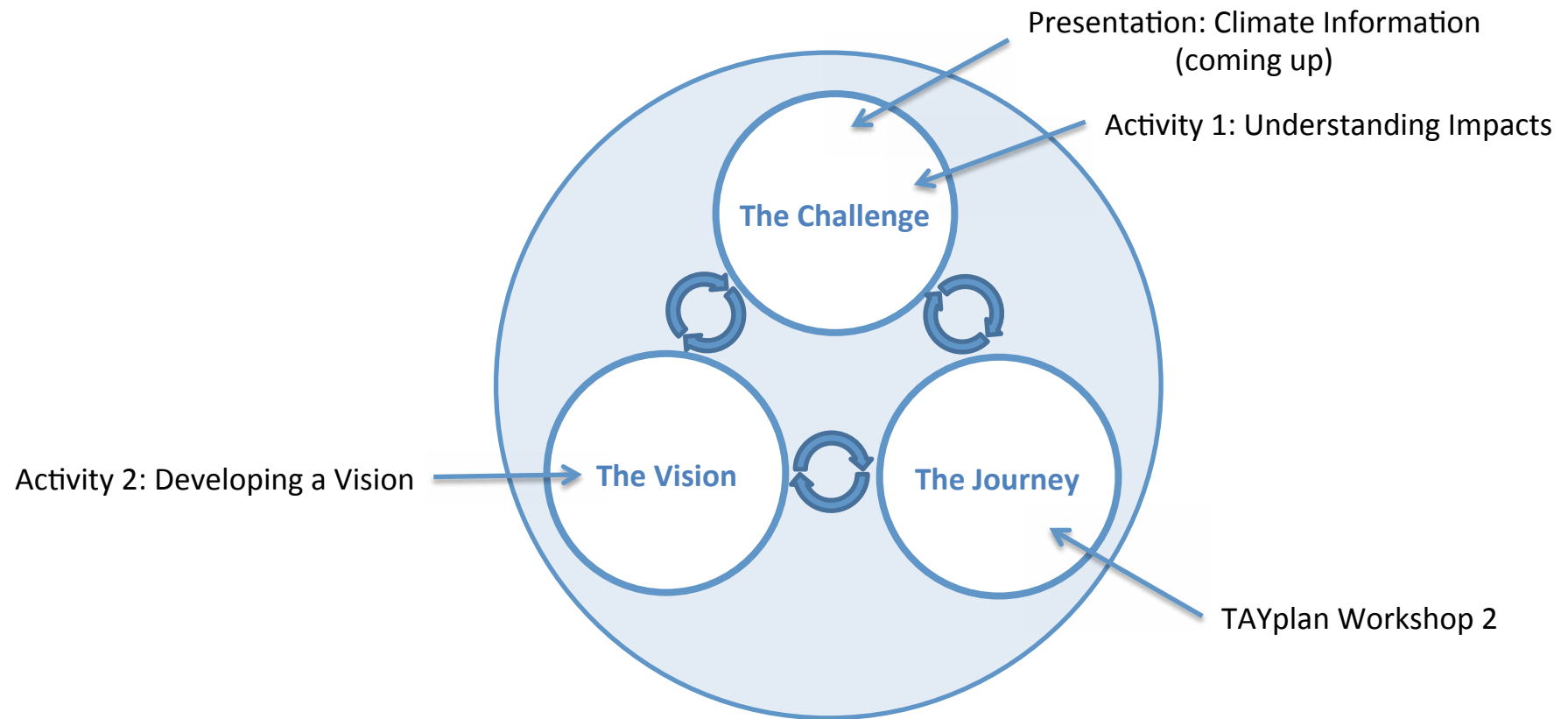
What direct measures can planning take?

How can planning support other initiatives?

How do we ensure on-the-ground action?



what are we doing today?

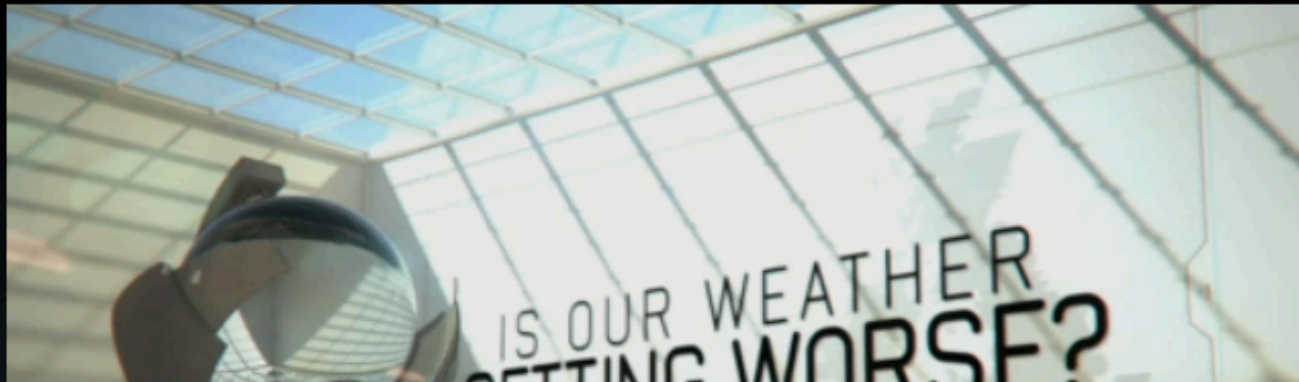


WARNING: This is an introduction to stimulate thinking – unfortunately adaptation to climate change cannot be solved in a workshop!!



Part Two: Information on Climate Change





The Year Britain Flooded

ABOUT

SERIES & EPISODES

CLIPS

A look at why the floods of 2012 happened, and the personal stories of the people caught up in them

Next on Channel 4
Tue 12 Feb, 9pm



[f](#) [t](#) > Share this



Is Our Weather



Tough times will not hit Comrie flood help

By RICHARD BURDOE, 11 February 2013 11:58am



Comrie residents are being assured pressure on the Highland Council will lead to investment to reduce flood risks.



Driver injured after tree falls on car during high winds and heavy rain

By Catherine Shanks 25 September 2012 10:10 BST



Dundee: A tree crashed onto a car at Arbroath Road.

Miraculous escape for horses after snow destroys Angus barn roof

28 January 2013 5:13pm



Annabelle Brooks outside the collapsed building.

DC Thomson

Rain stops play at indoor centre

1 February 2013 9:00am

A LEAKY sports centre roof has turned Dundee into "the only place in the country where you have to check the weather forecast before playing indoor football".

Seven-a-side player Barry Chalmers made the claim after becoming fed up of turning up at the Lynch Sports Centre, on South Road, only to find his game has been cancelled.

Mr Chalmers (29) said: "I've been playing football on Tuesday nights for about eight years now.

"In the winter of 2006 we went along to play and were told our game had been called off because of a leak in the roof.

"Previous to that there would occasionally be patches of water on the pitch after it had been raining which we would mop up with paper towels."

Mr Chalmers said his team was often played in a hall in the town.

Frost and snow to hit Britain as October heatwave comes to abrupt end

Cold winds, frost and even some snow are to hit Britain this week, signalling the end of the October heatwave.



The beginning of the month saw record-breaking temperatures of 29C. Photo: HEATHCLIFF O'MALLEY

7:38AM BST 16 Oct 2011

Temperatures peaked at an unseasonably high 18.3C (64.94F) in Gravesend, Kent, on Saturday, but temperatures are set to drop in the

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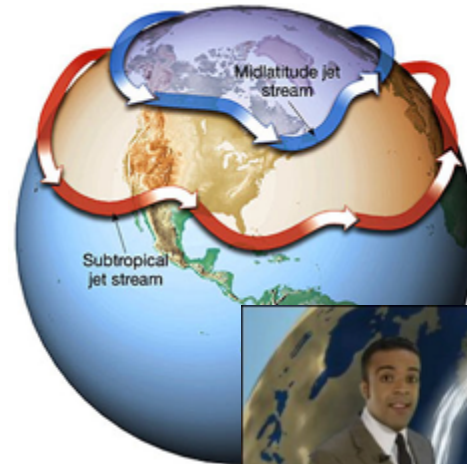
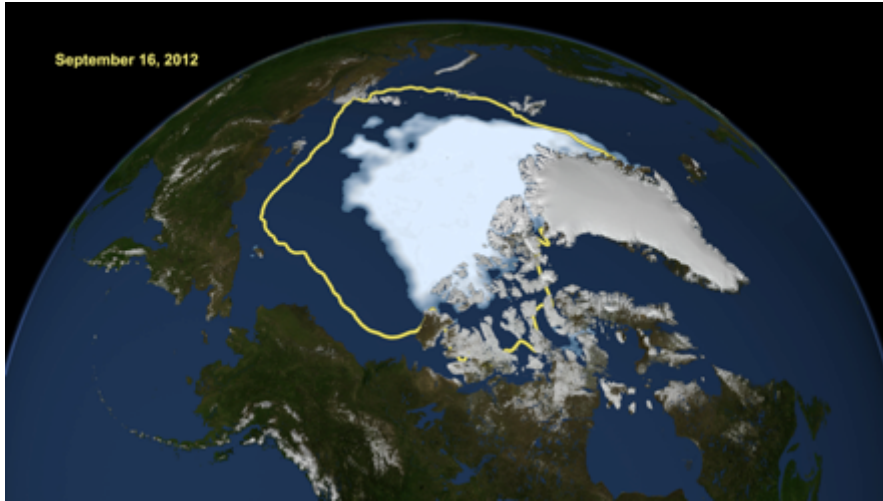
Fife councillor says mining union legal bill is 'ridiculous'

Perthshire group hopes fundraising gigs put brass in pockets

Beauty is in the eye of the bin holders

Inverkeilor campaigner calls for 'pragmatic approach' to

Arctic Sea Ice Minimum



Jetstream



North America

Floods

Sandy

Wildfires

Tornadoes

Derecho

Drought

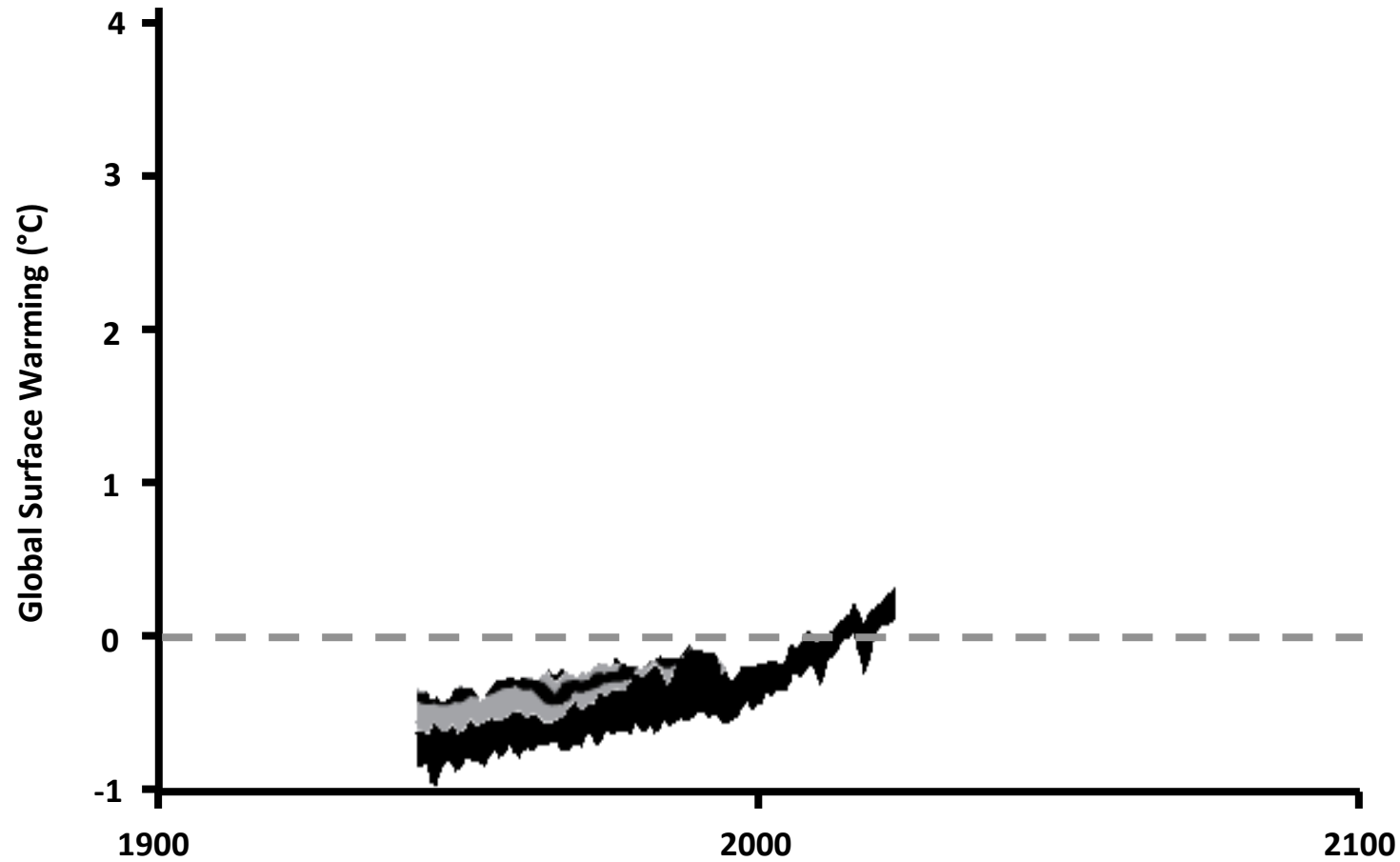
Heatwave

A central graphic of a globe with the text 'North America' above it. Seven small images are arranged around the globe, each labeled with a weather event: Floods (a flooded street), Sandy (a satellite view of a hurricane), Wildfires (burning houses), Tornadoes (a town with a destroyed street), Derecho (a large, dark storm cloud), Drought (a person holding a small, dried-up plant), and Heatwave (people playing in a water fountain).

2012 Global Weather



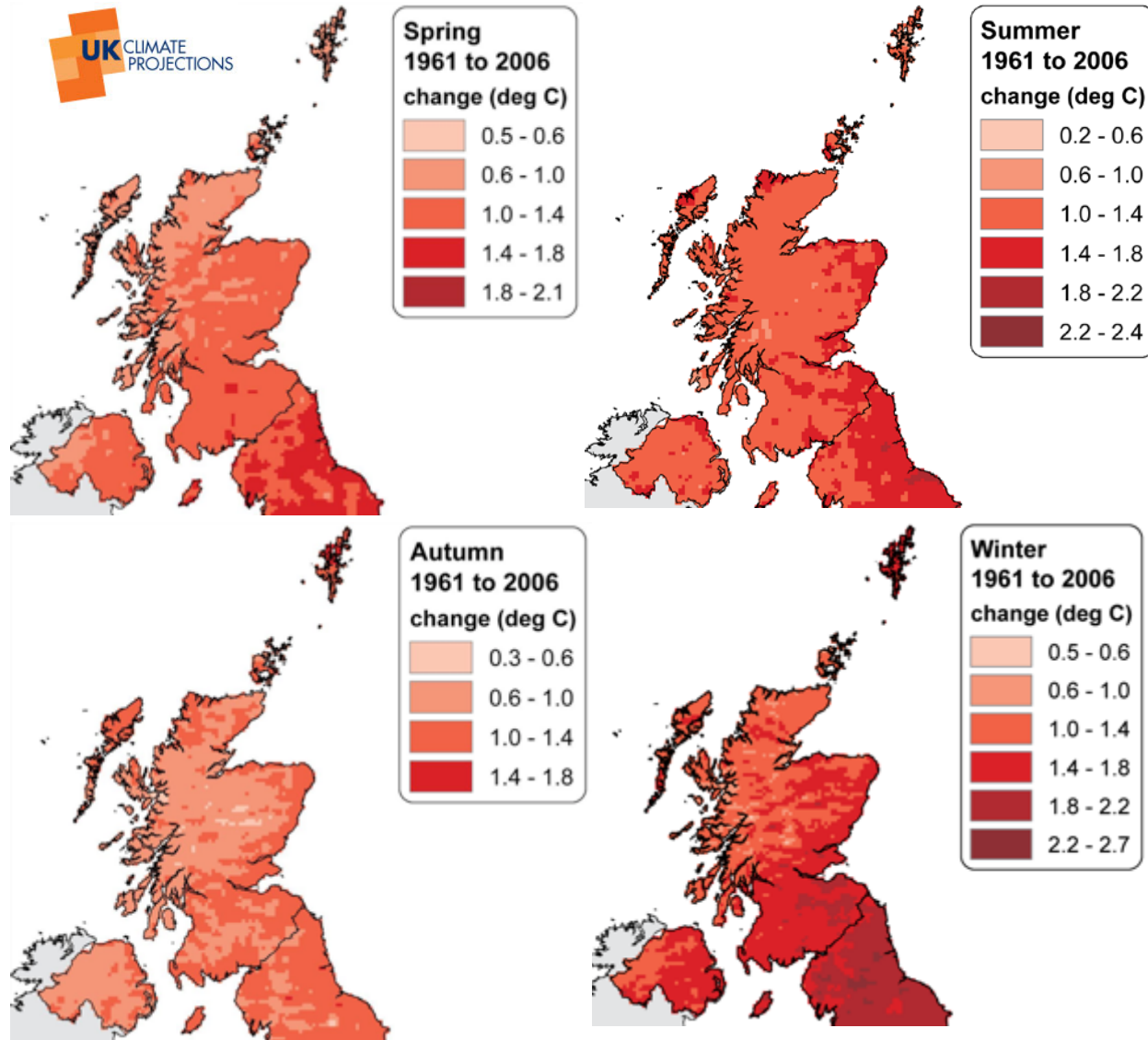
We've already seen the global climate change



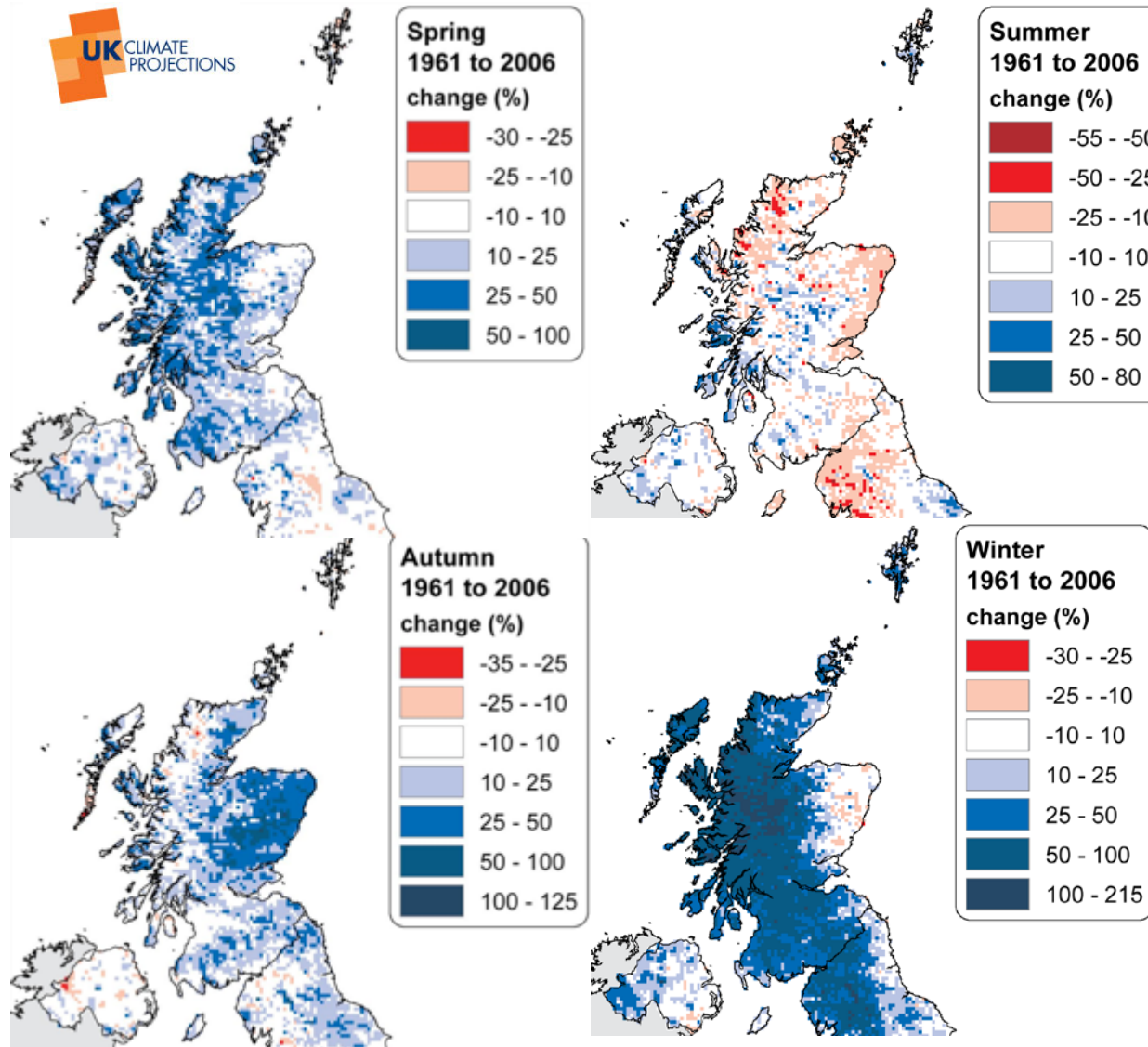
Source: adapted from NASA Earth Observatory
data IPCC 2007 WG1 AR-4



Recent change in mean temperature (1961 to 2006)

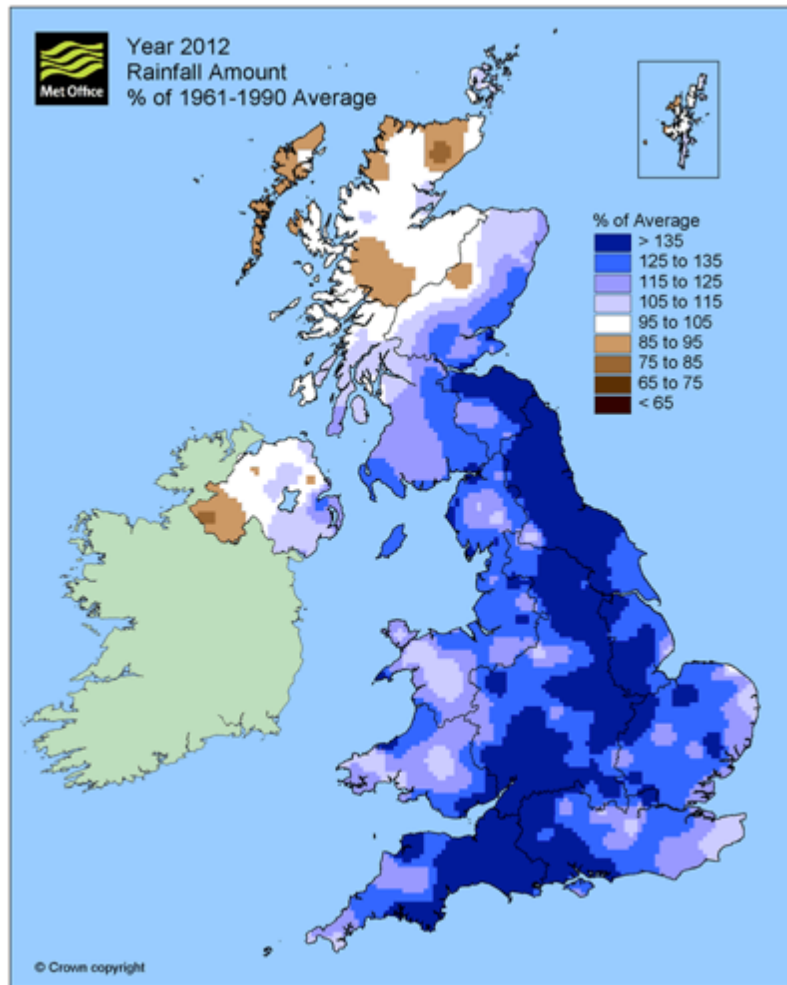


Recent change in rainfall (1961 to 2006)

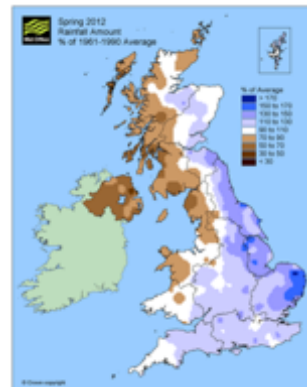


Rainfall in 2012

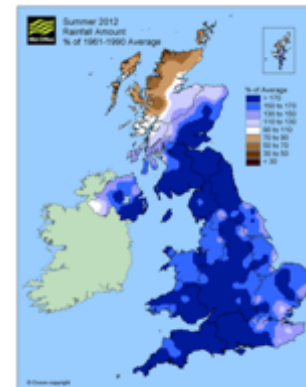
Annual



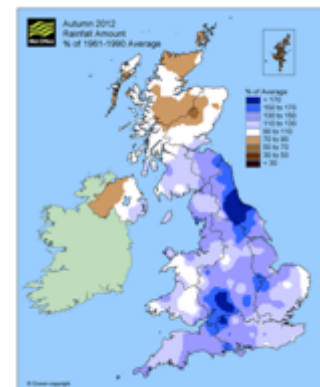
Spring



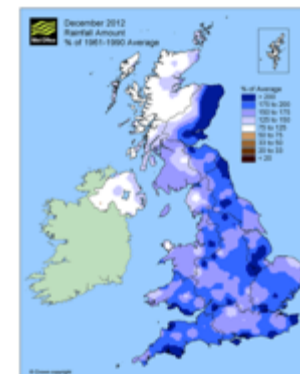
Summer



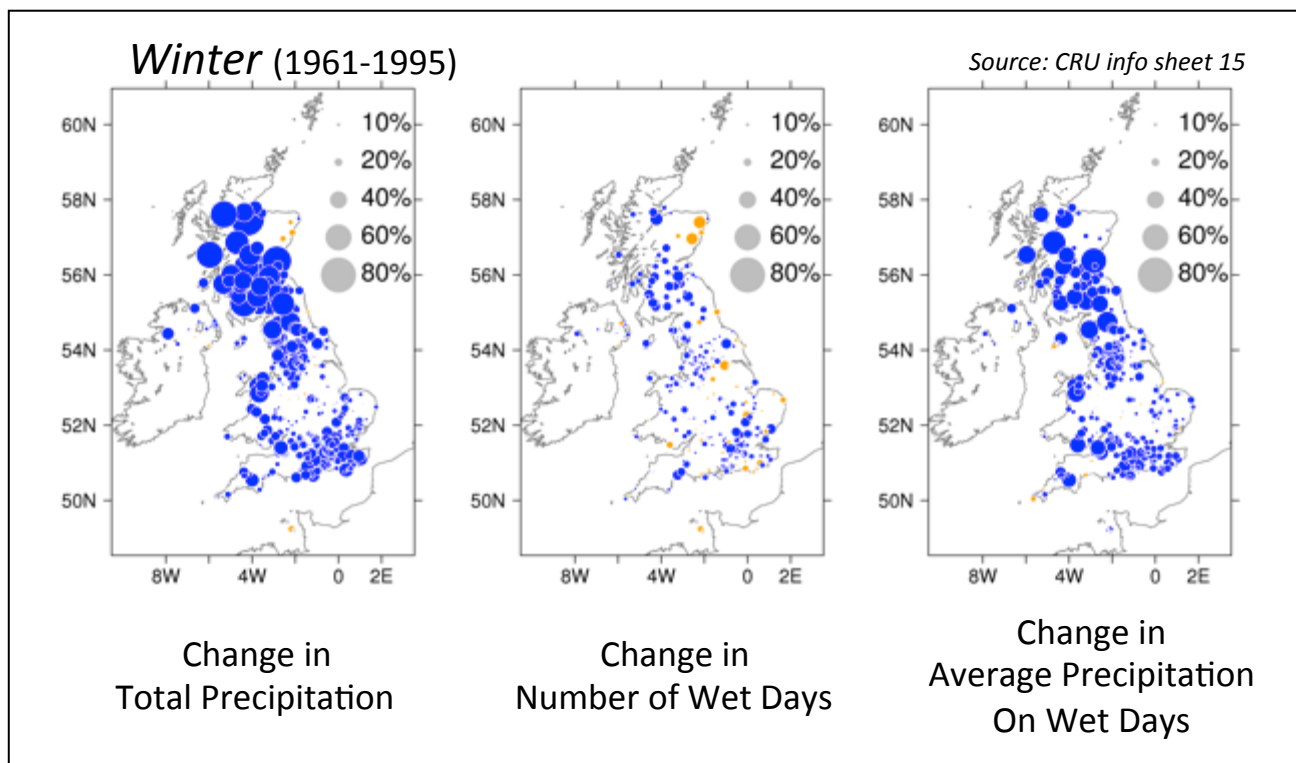
Autumn



December



Rainfall has increased over the last 50 years... This increase is mostly due to heavier rainfall on wet days (rather than more wet days)



In London extreme rainfall events occurred once every 30 years before 1960 - and once every 6 years since then...

source: Lloyds (2010)



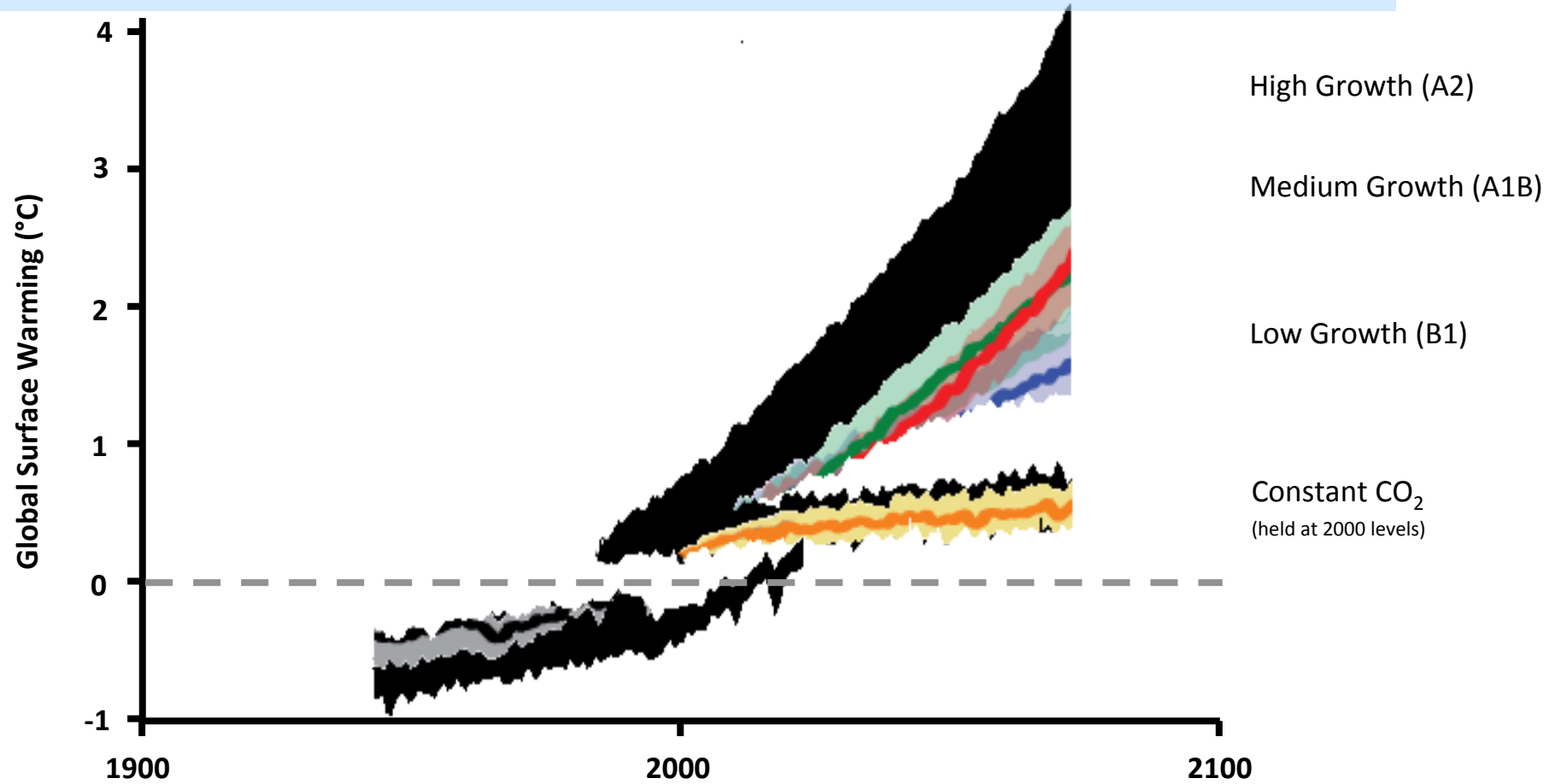
Are we 'adapted' to today's climate?



Adaptation to Present Climate or Weather

Adaptation to Future Climate Change

Projections of Future Global Climate



Source: adapted from NASA Earth Observatory
data IPCC 2007 WG1 AR-4



What do we know about Scotland's Future Climate?

Over the last few decades we have seen remarkable progress in our understanding of climate – and how humans are changing it...

... and we continue to improve on this.



Scotland has access to world leading information – the UK Climate Projections - about how our climate is likely to change over this century.

<http://ukclimateprojections.defra.gov.uk/>



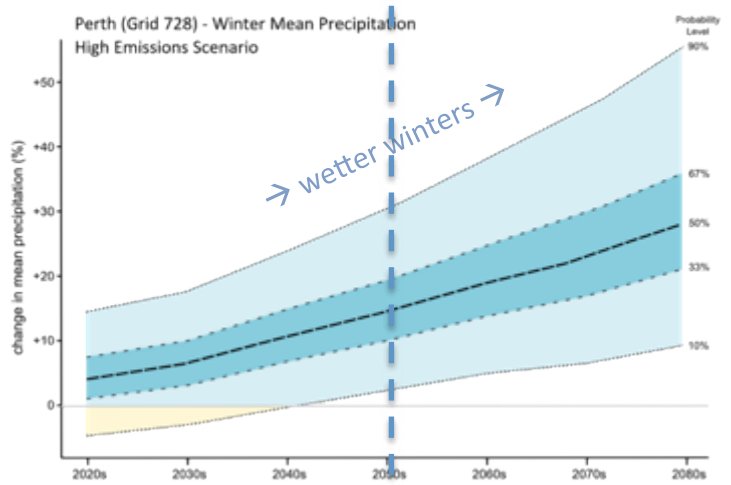
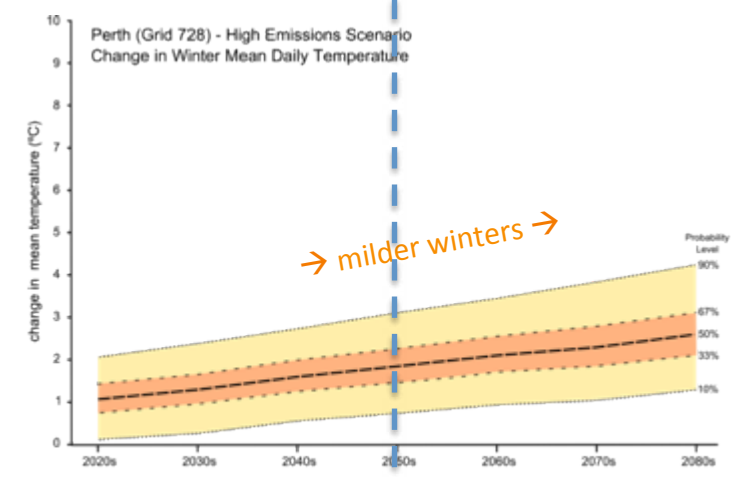
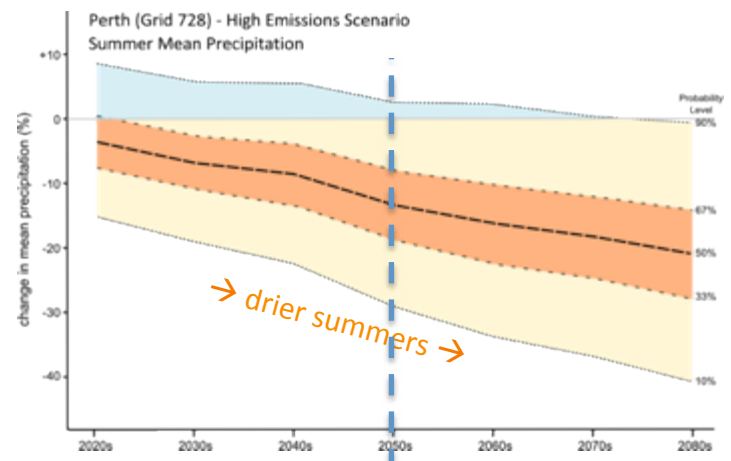
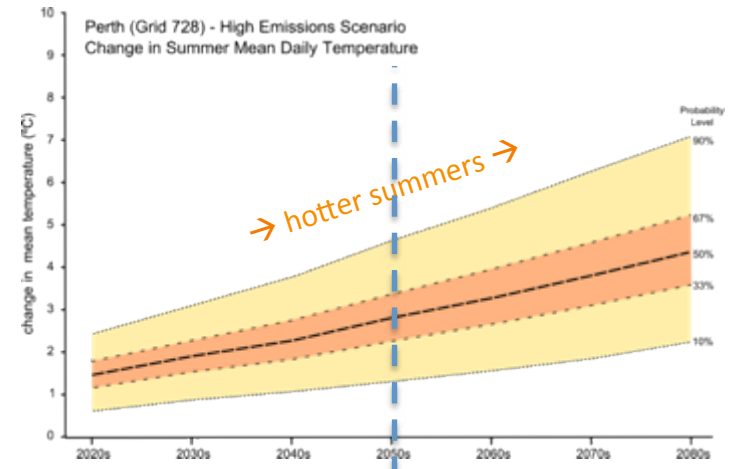
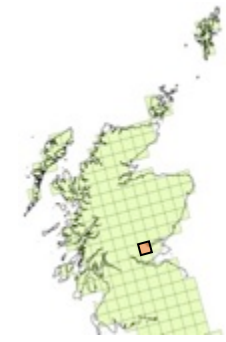
The key long-term climate change trends for Scotland are:

- Average summer is hotter and drier
- Average winter / autumn is milder and wetter
- Weather will remain variable (e.g. year-to-year), it may become more variable

We can also expect to see:

- Increase in summer heat waves, extreme temperatures and drought
- Increased frequency and intensity of extreme precipitation events
- Reduced occurrence of frost and snowfall
- Sea level rise



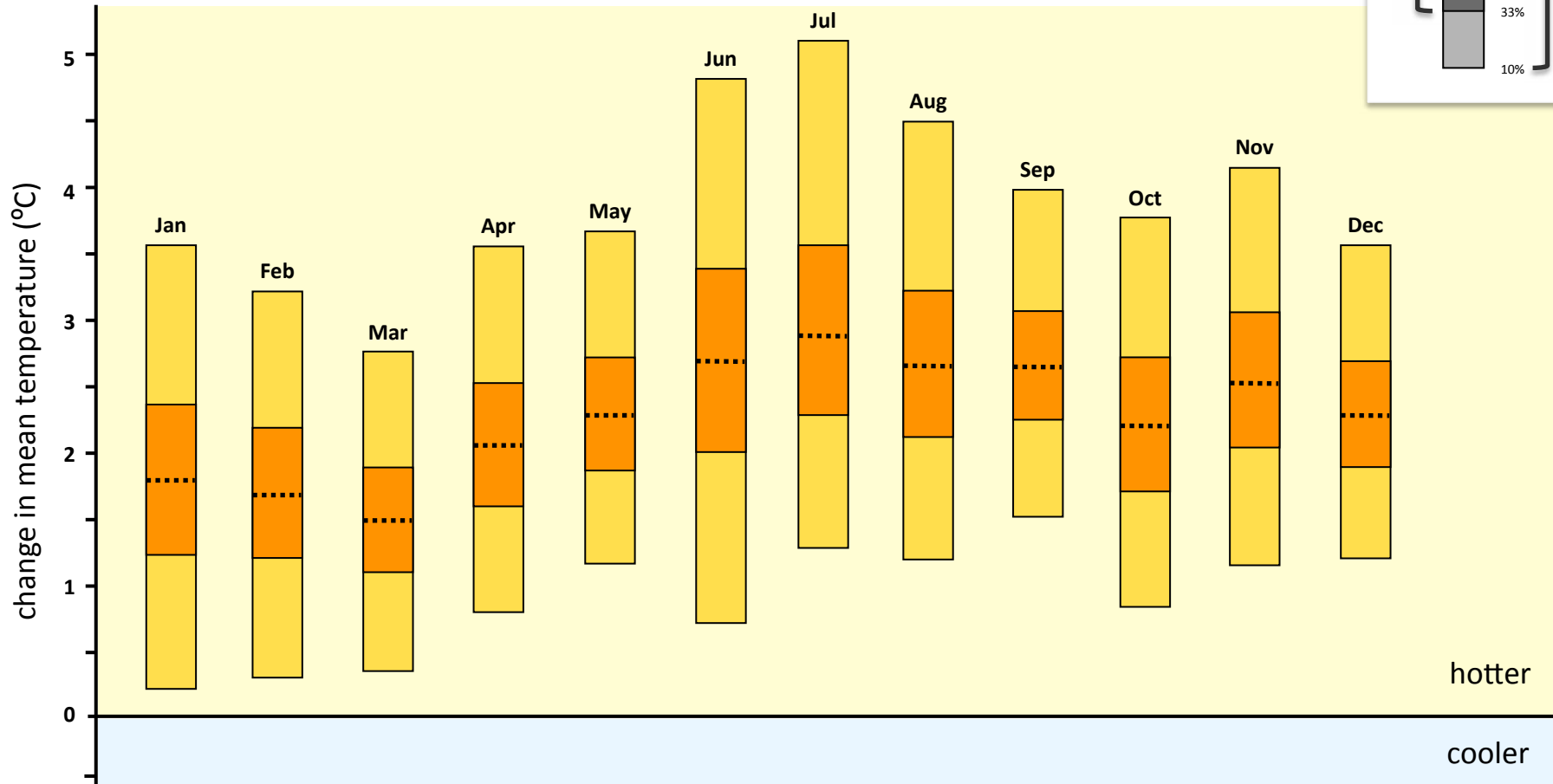
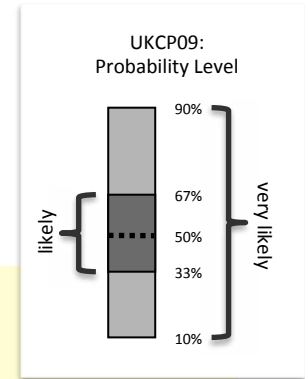


2050s



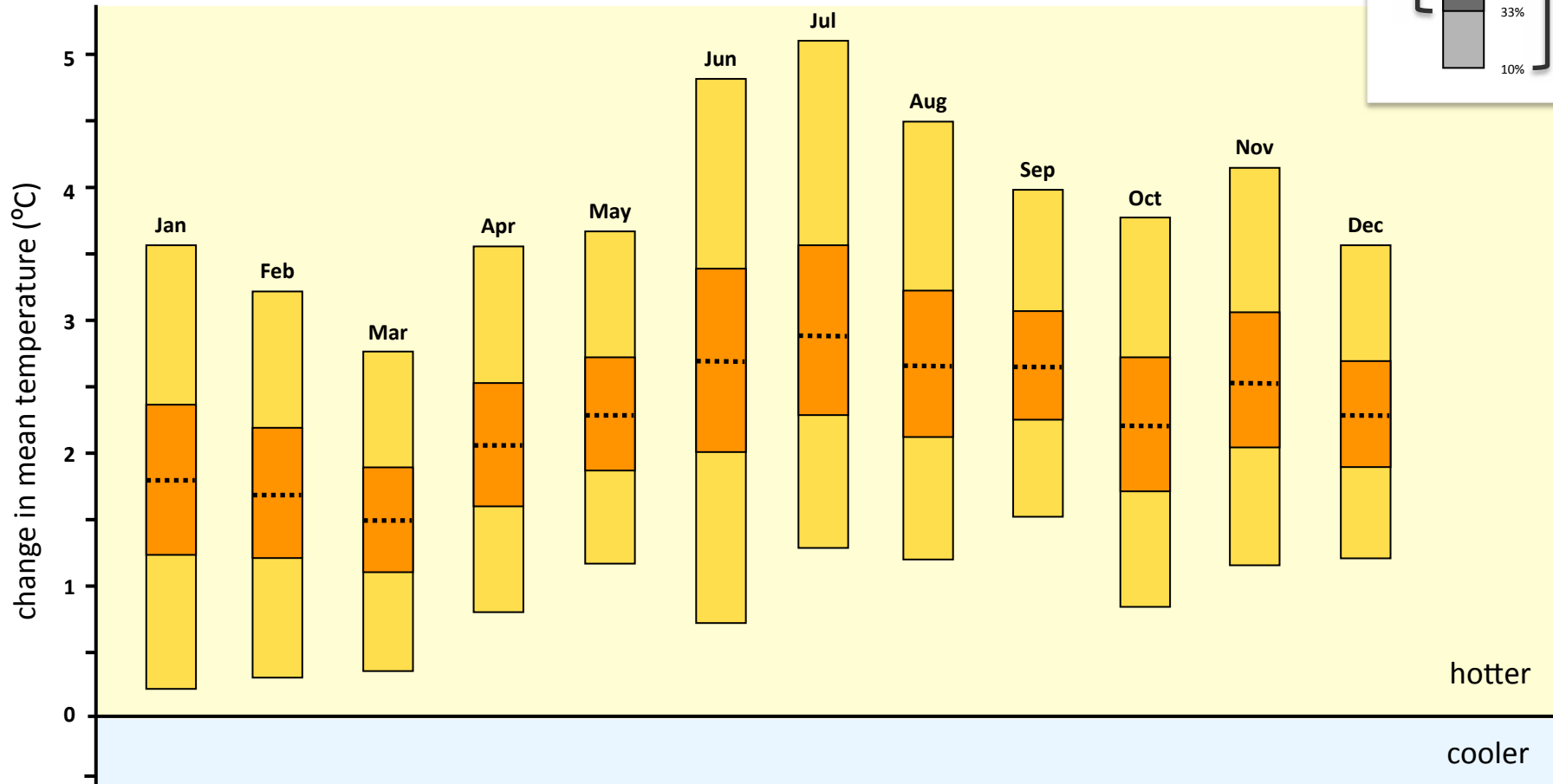
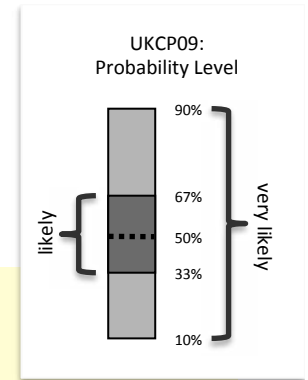


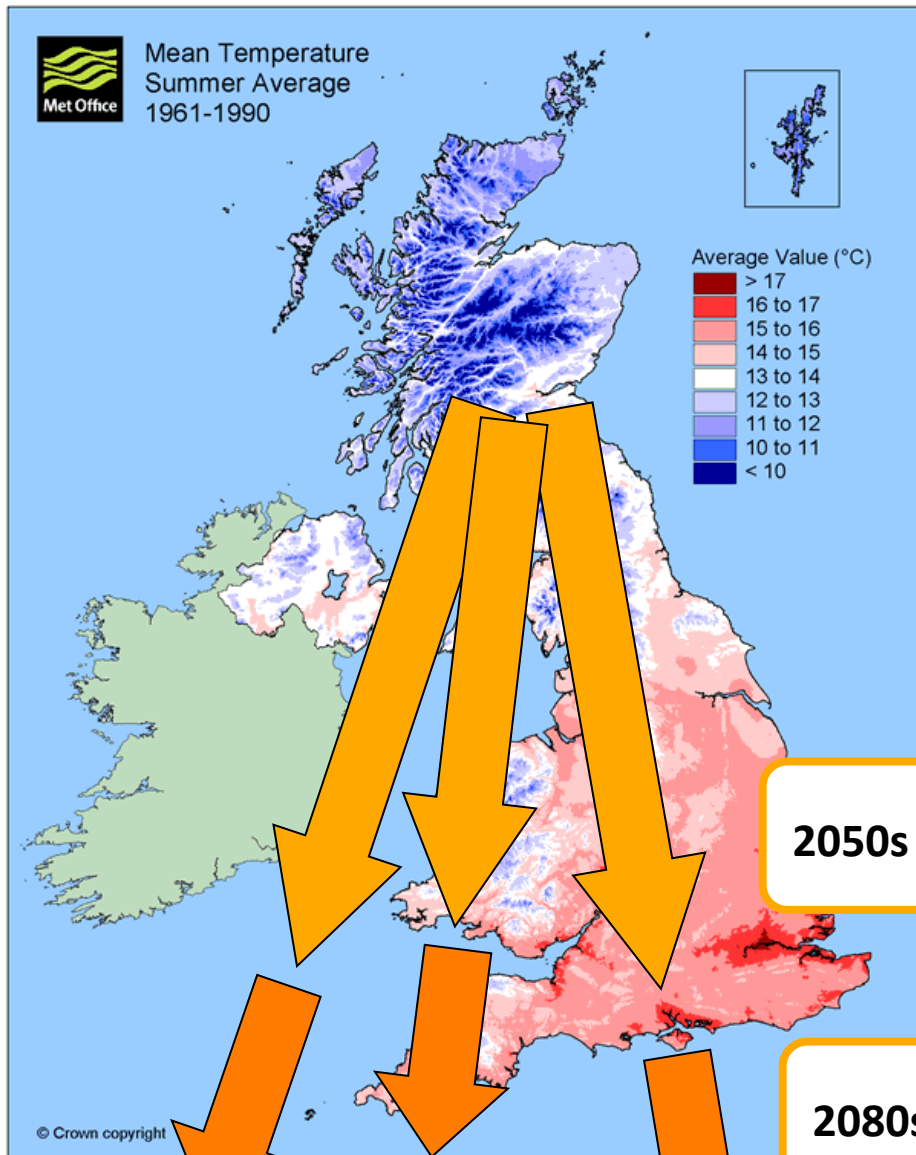
Projected Change in Mean Temperature (°C) for Perth in 2050s High Emissions (A1FI) - Grid 728





Projected Change in Mean Temperature (°C) for Perth in 2050s High Emissions (A1FI) - Grid 728





What difference do a few degrees make?

Isle of Wight

2.6°C

warmer in summer than the Dundee
(in baseline 1961-1990)

2050s

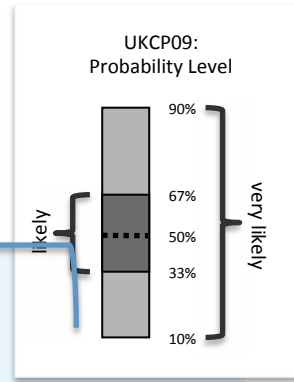
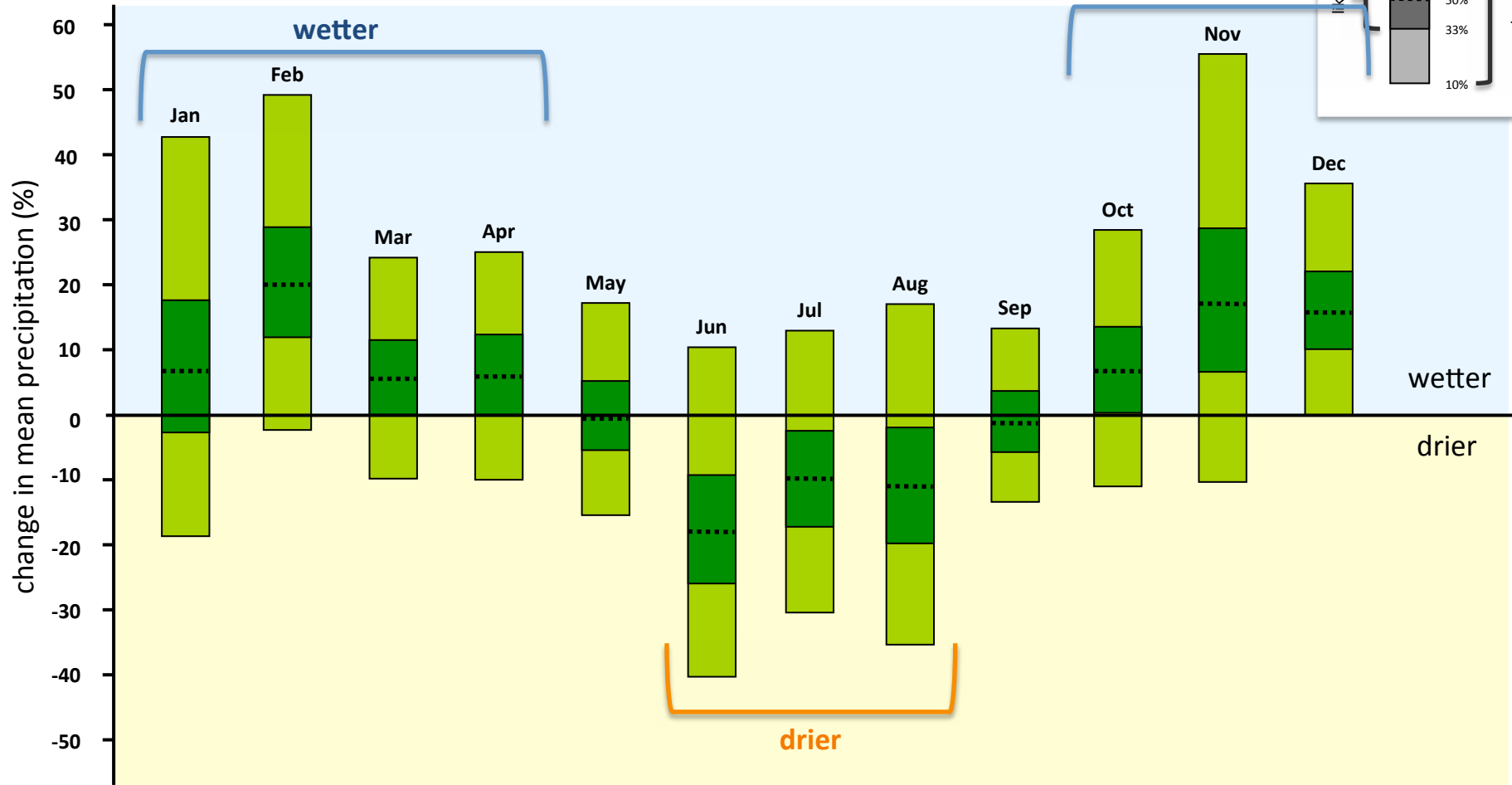
So our summer temperatures may be more similar to those in southern England by the 2050s...

2080s

... and unlike anything currently experienced in the UK by the 2080s



Projected Change in Mean Precipitation (%) for Perth in 2050s High Emissions (A1FI) - Grid 728



Changes in extreme rainfall

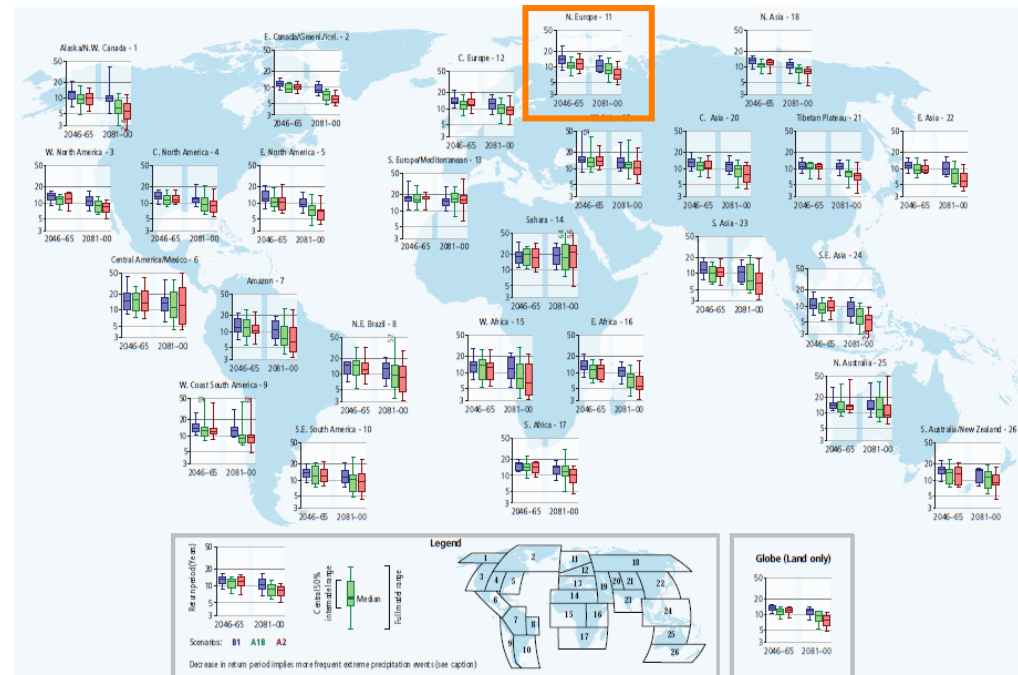
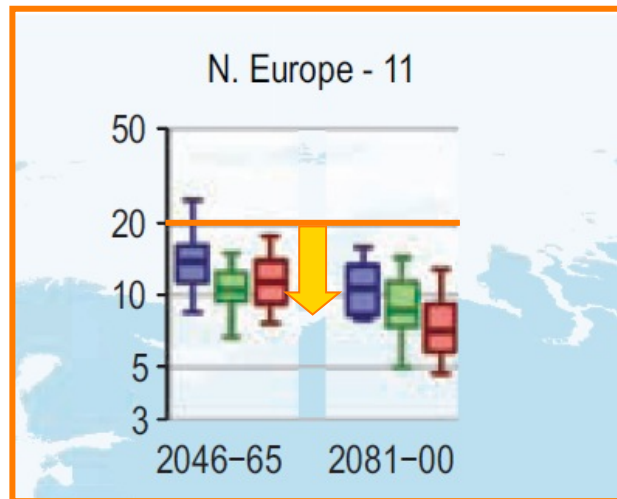


Figure SPM.4B | Projected return periods for a daily precipitation event that was exceeded in the late 20th century on average once during a 20-year period (1981–2000). A decrease in return period implies more frequent extreme precipitation events (i.e., less time between events on average). The box plots show results for regionally averaged projections for two time horizons, 2046 to 2065 and 2081 to 2100, as compared to the late 20th century, and for three different SRES emissions scenarios (B1, A1B, A2) (see legend). Results are based on 14 GCMs contributing to the CMIP3. The level of agreement among the models is indicated by the size of the colored boxes (in which 50% of the model projections are contained), and the length of the whiskers (indicating the maximum and minimum projections from all models). See legend for defined extent of regions. Values are computed for land points only. The 'Globe' inset box displays the values computed using all land grid points. [3.3.2, Figure 3-1, Figure 3-7]





Are we loading the 'climate dice' for extreme weather events?



The sea is rising.....

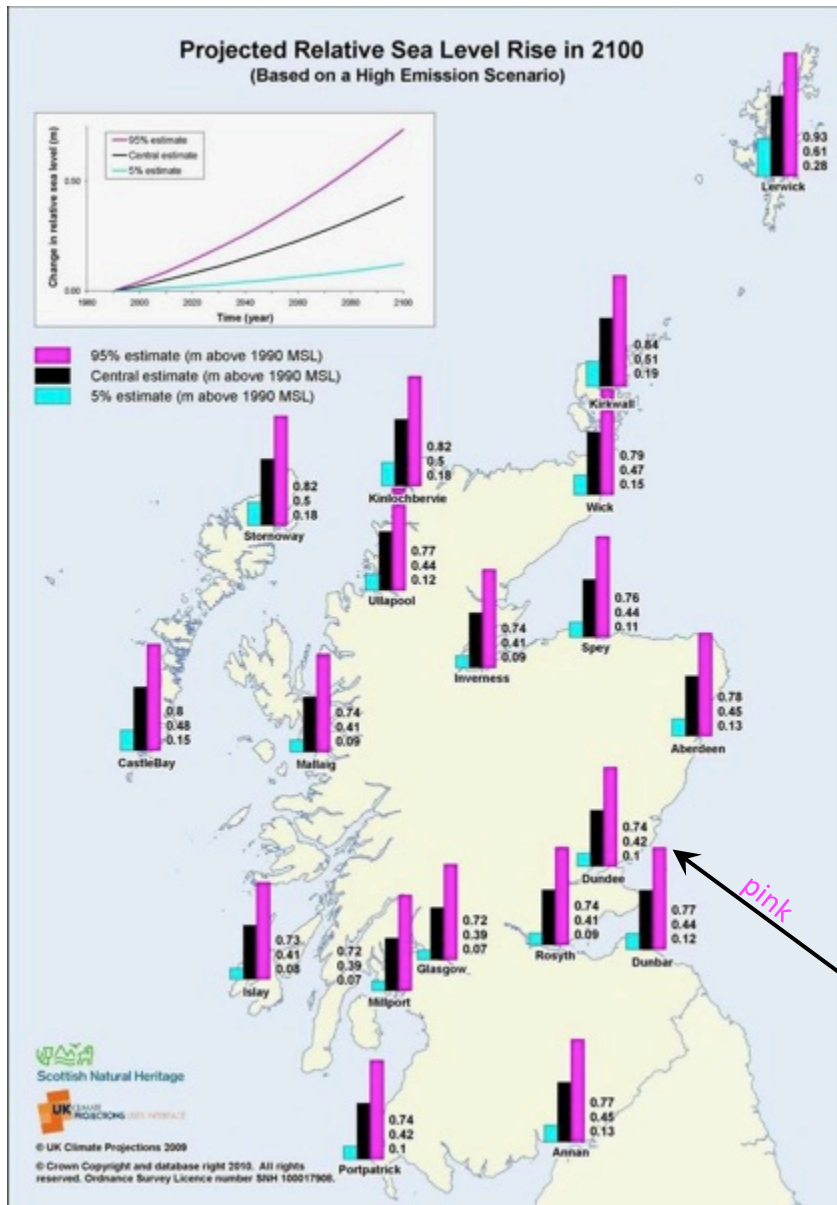


[@ITV 2008 Flood](#)



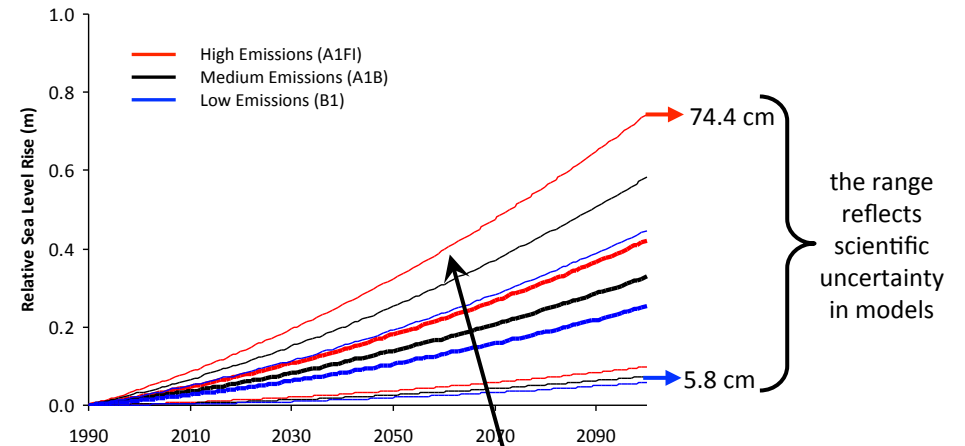
[@ITV 2008 Flood](#)





UKCP09 Relative Sea Level Rise

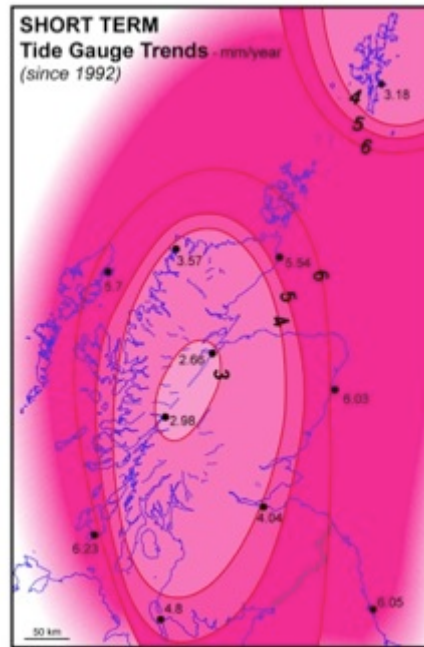
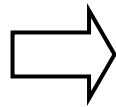
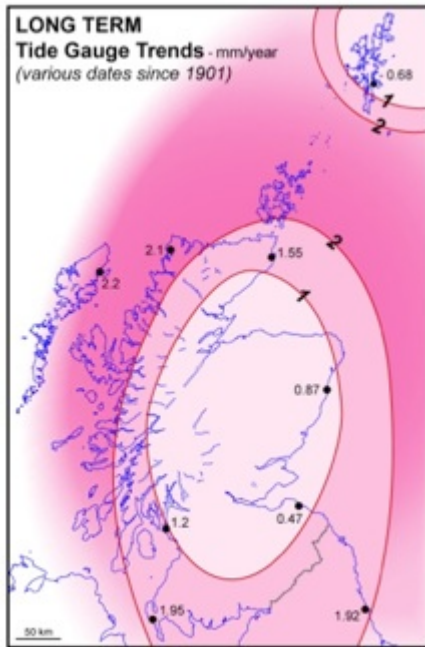
Dundee



Should we consider the upper estimates from UKCP09?



Records from Tidal Gauges in Scottish Ports



Rennie & Hansom (2010)

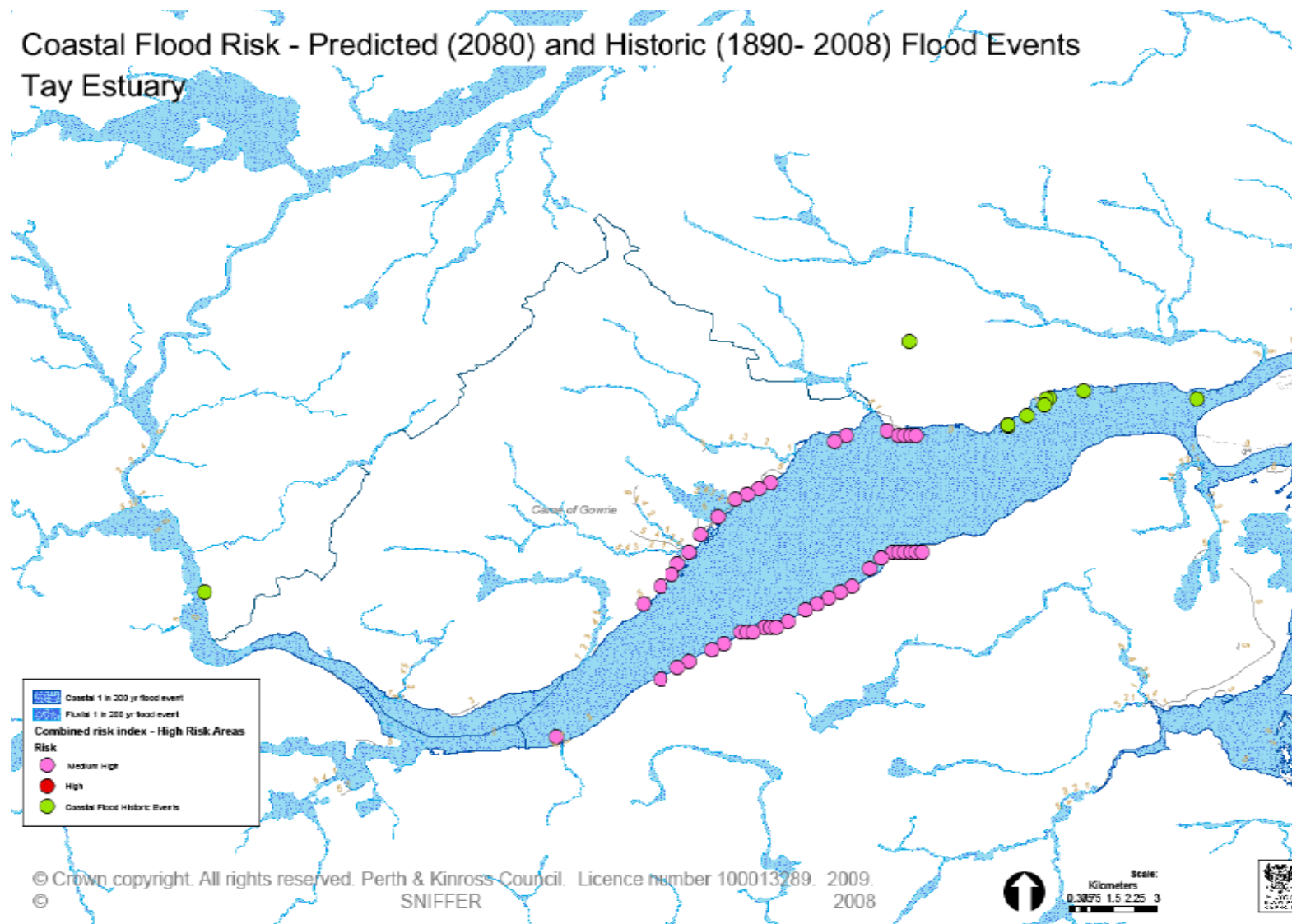
Recent analysis of tide gauge records at Scottish Ports indicates that sea level is now increasing around Scotland...

... and the rate of sea level rise appears to be increasing since 1992...

... these recent trends would put Scotland on the 95% frequency high emissions of UKCP09 model outputs



Coastal Flood Risk - Predicted (2080) and Historic (1890- 2008) Flood Events Tay Estuary



How does sea level rise impact on the coast?

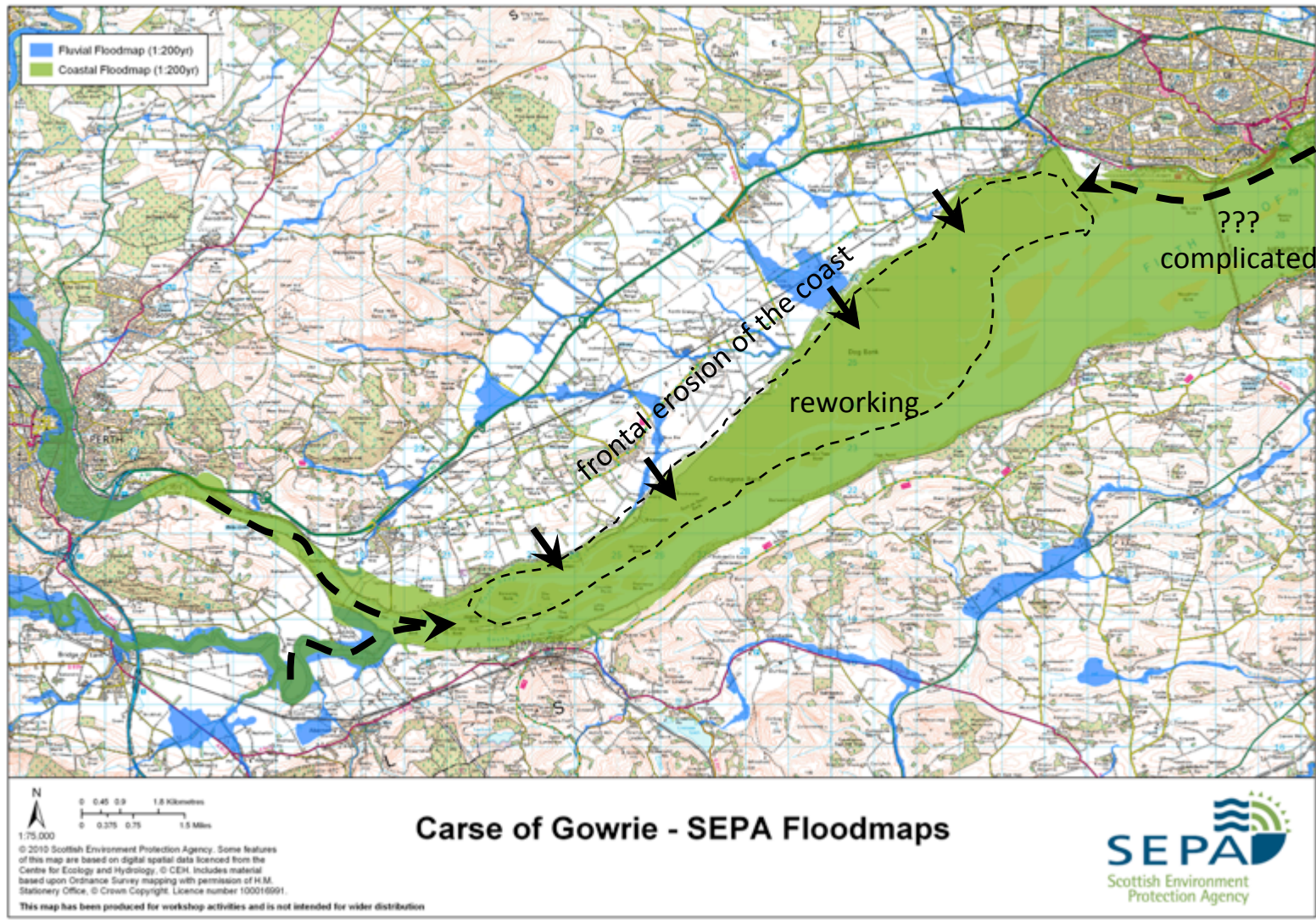
Sea level rise can lead to **instability, erosion and reworking** of coasts

Rates of sea level rise **>3-4 mm** year can lead to **widespread reorganisation** of coastal landforms

The response of a coastline will depend on the **balance between sediment supply and sea level rise**... retreat will occur when there is inadequate sediment supply to maintain the coast under conditions of sea level rise

Most **Scottish coasts are sediment-supply limited** – due to terrestrial conditions (limiting erosion), natural coastal processes, and human alteration of coastal sediment movement (breakwaters and embankments)





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- please contact us -

www.adaptationscotland.org.uk
adaptationscotland@sniffer.org.uk

Adaptation Scotland Partnership:

