

ACNA5001



SEA LEVEL RISE AND ADAPTATION



ALISSA FLATLEY

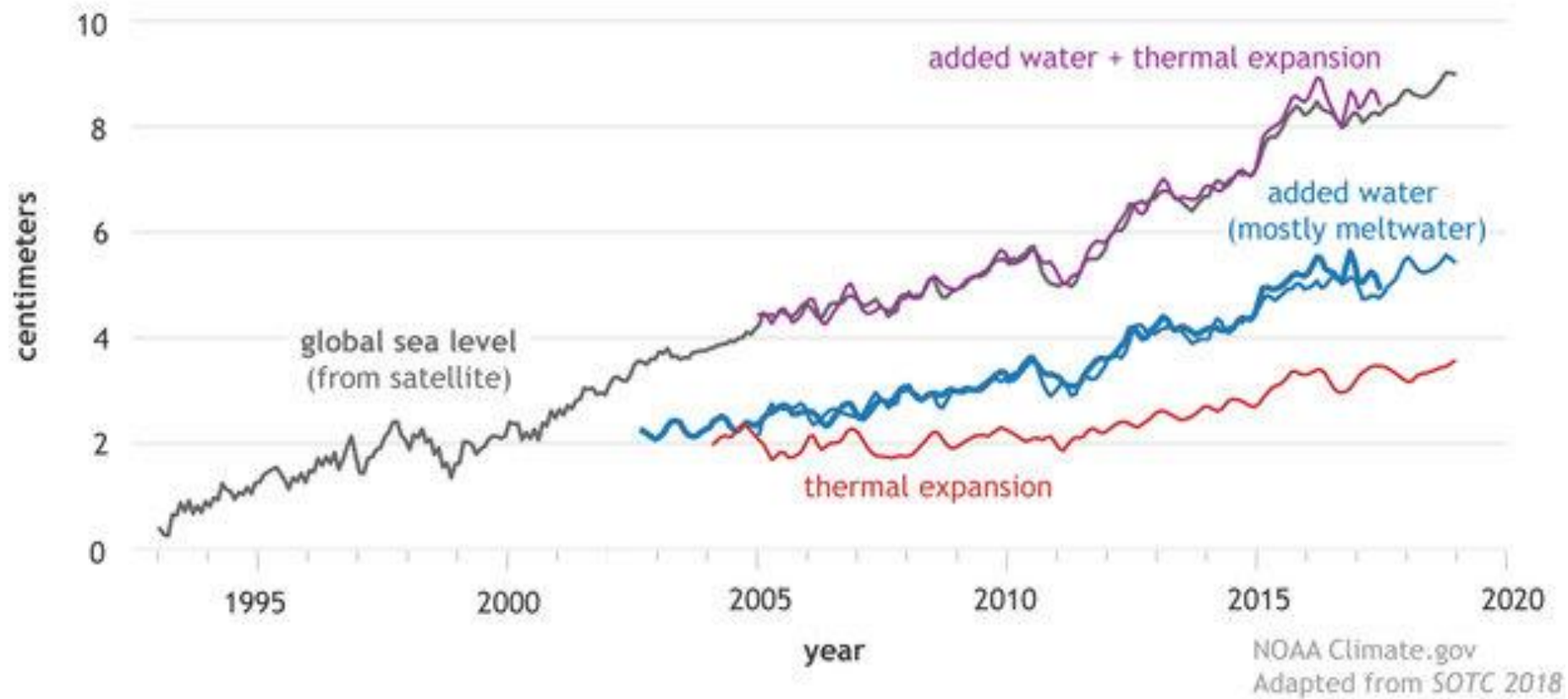
OUTLINE

- 1) SEA LEVEL RISE AND ADAPTATION
- 2) LARGE SCALE MANAGEMENT AND FRAMEWORKS
FOR COASTAL MANAGEMENT
- 3) SHORELINE MANAGEMENT PLANS

WHY DOES SEA LEVEL RISE?

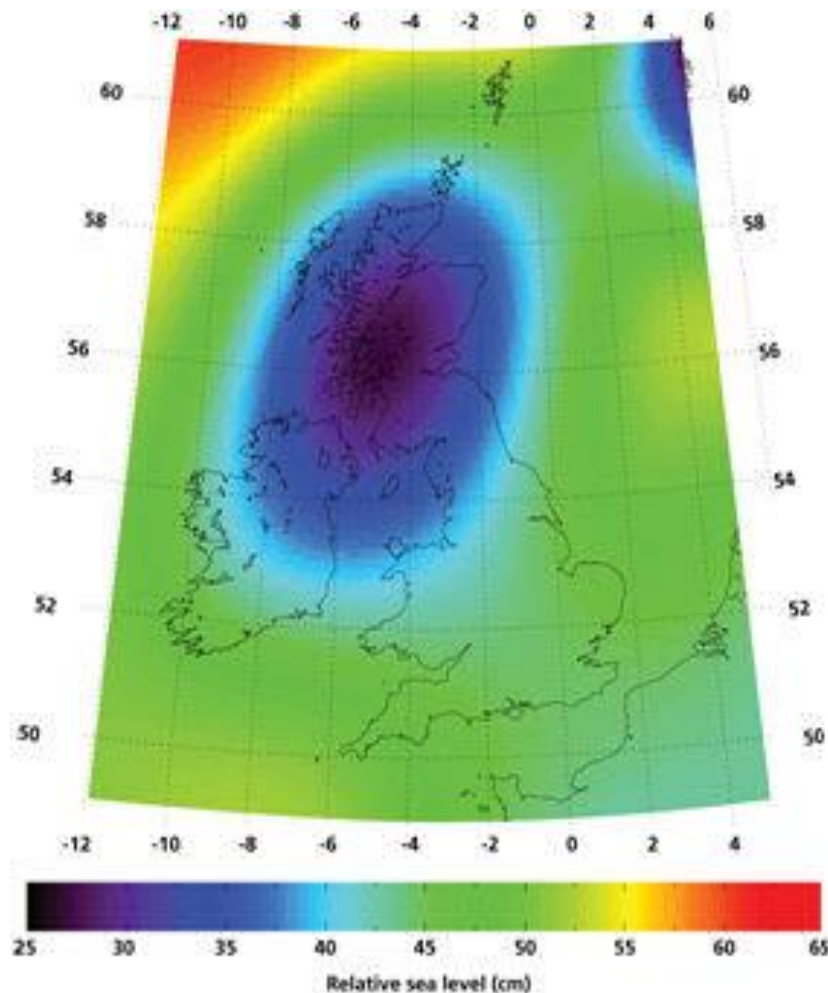
SEA LEVEL RISE

Contributors to global sea level rise (1993-2018)



The scale of the challenge

SEA LEVEL RISE

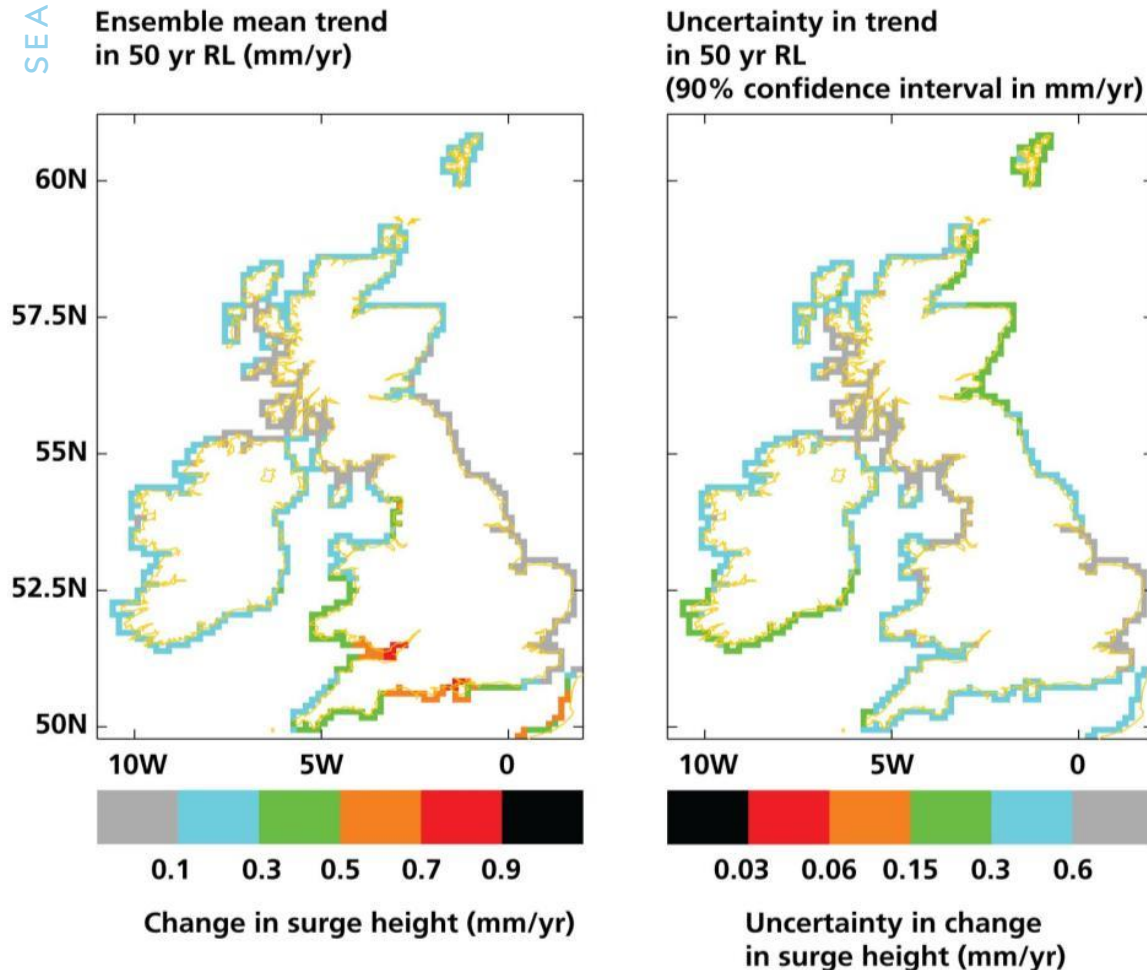


- 12-76cm sea level rise by 2080. Under UKCP09, the mean estimate sea level rise to 2080 is around 30-40cm, although it could be between 12cm – 76cm – uncertainty is high.
- Extreme predictions of up to 1.9m by 2100
- Wave height changes unclear: Winter mean - 35cm to +5cm, annual maxima -1.5m to +1m

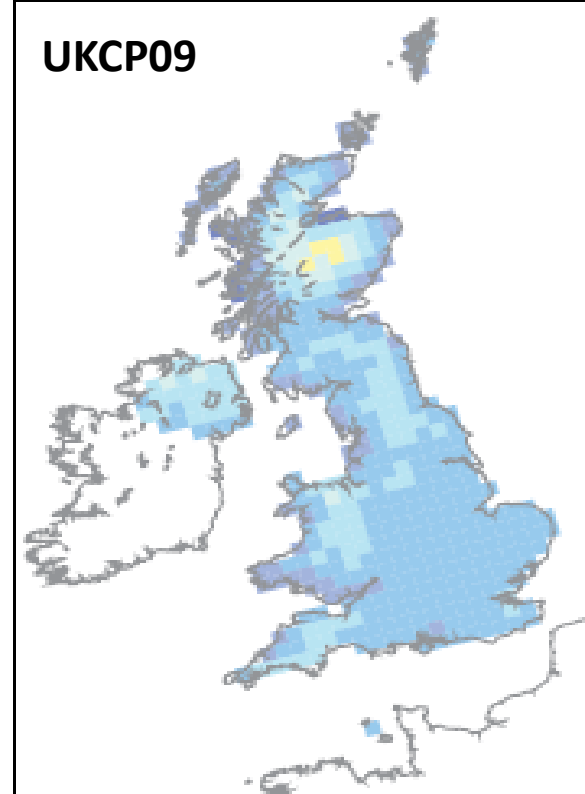
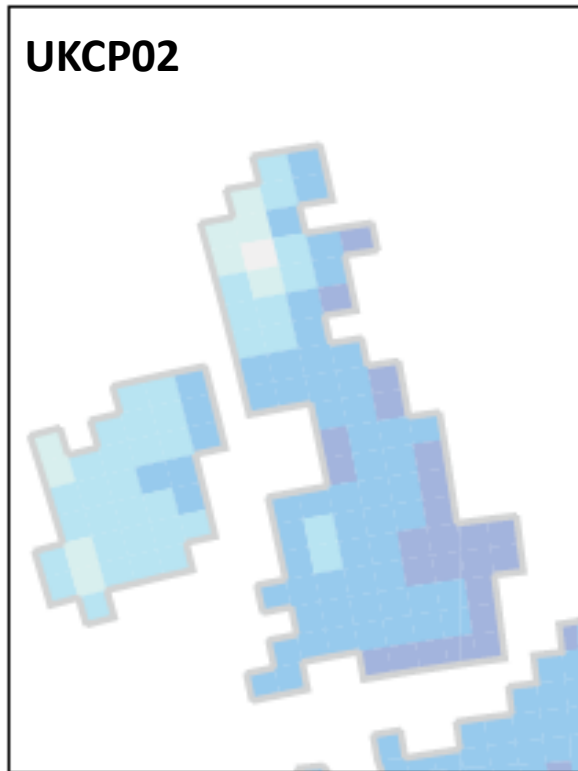
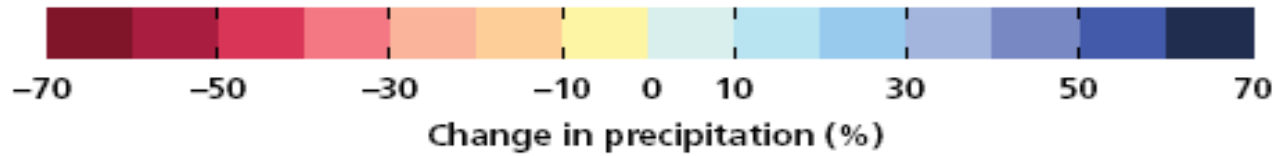
[Project Record: UK Climate Projections 2009 \(UKCP09\) \(ceda.ac.uk\)](http://ceda.ac.uk)

Storm Surge

SEA LEVEL RISE



- UKCP09 predicts storm surge to be not more than 90mm anywhere in UK, but this is on top of sea-level rise.
- It is widely thought that storm surges will increase in frequency and height, but data is inconclusive. The best information we have suggests maximum increases of 90cm, focussed in the south and south east. Storm surge levels are predicted to increase by no more than 9cm by 2100.



50% probability level, central estimate

Rainfall Patterns

More intense rainfall
contributing to cliff
erosion?

We can expect increases in precipitation
that, together with sea level rise and
storm surge changes, might have
implications for coastal erosion
acting in parallel with groundwater
interactions with landslip.

Risk to people and property

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- Approximately 1.3 million people at coastal flood and erosion risk in England & Wales
- About 1 in 25 properties are at risk from sea flooding
- About a quarter of the coastline eroding at >10cm/year – but up to almost 2m/yr in some places
- 740 properties at risk from erosion in next 20 years



Mapping SLR

SEA LEVEL RISE



[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org)

[\(1\) Met Office: UK sea level rise speeding up - YouTube](#)

Mapping SLR

SEA LEVEL RISE

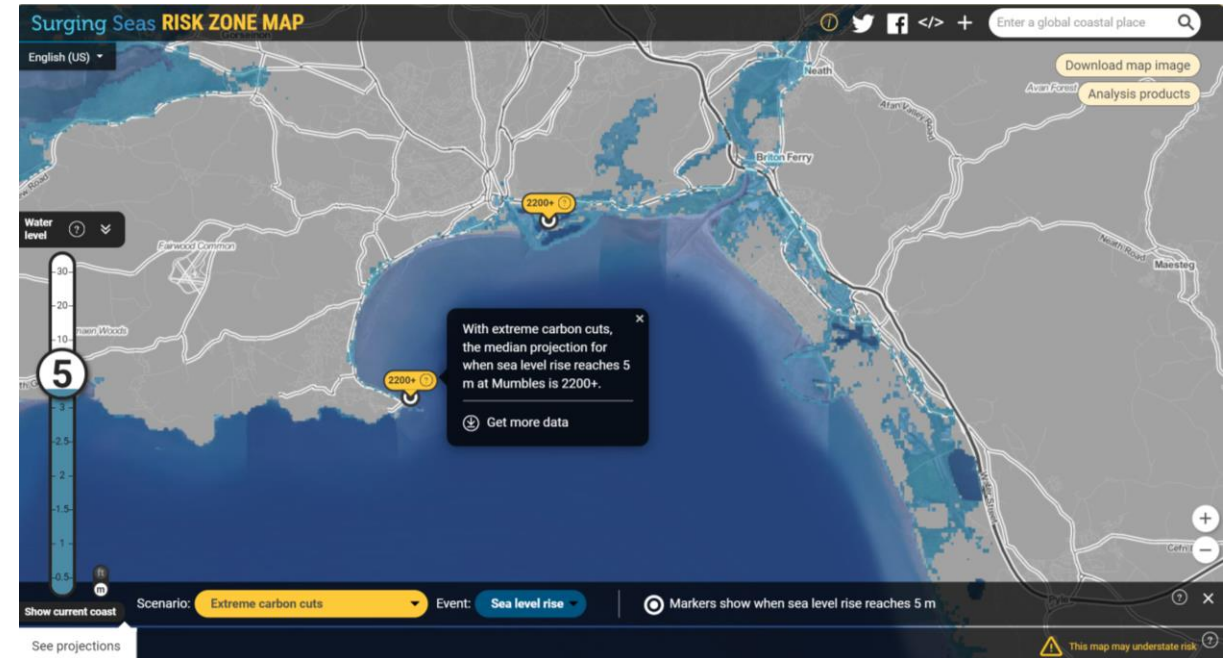


[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org/surging-seas-risk-zone-map)

[\(1\) Met Office: UK sea level rise speeding up - YouTube](#)

SLR projections in the Mumbles

- Navigate to Surging Seas: Risk Zone Map
- Find the Mumbles
- View the SLR projections under a range of scenarios (e.g. Extreme Carbon Cuts)

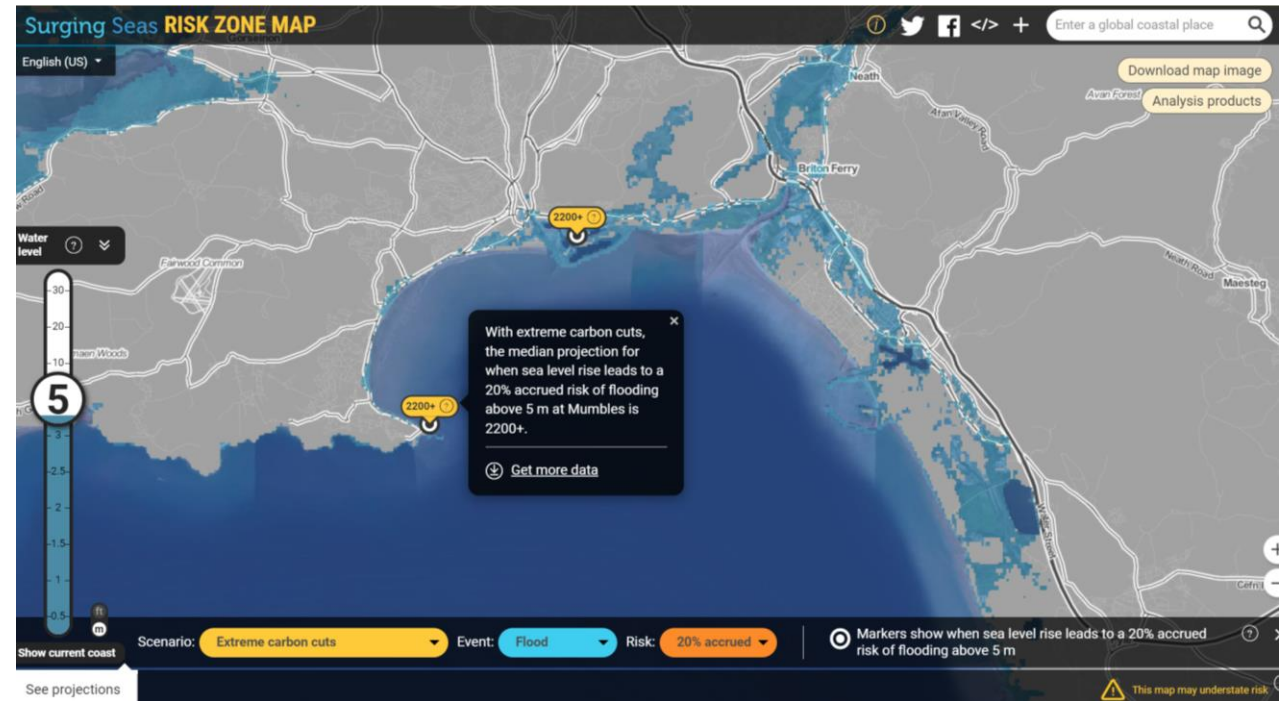


[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org/surging-seas-risk-zone-map)

[\(1\) Met Office: UK sea level rise speeding up - YouTube](#)

SLR projections in the Mumbles

- Navigate to Surging Seas: Risk Zone Map
- Find the Mumbles
- View the **Flood Risk** projections under a range of scenarios (e.g. Extreme Carbon Cuts)



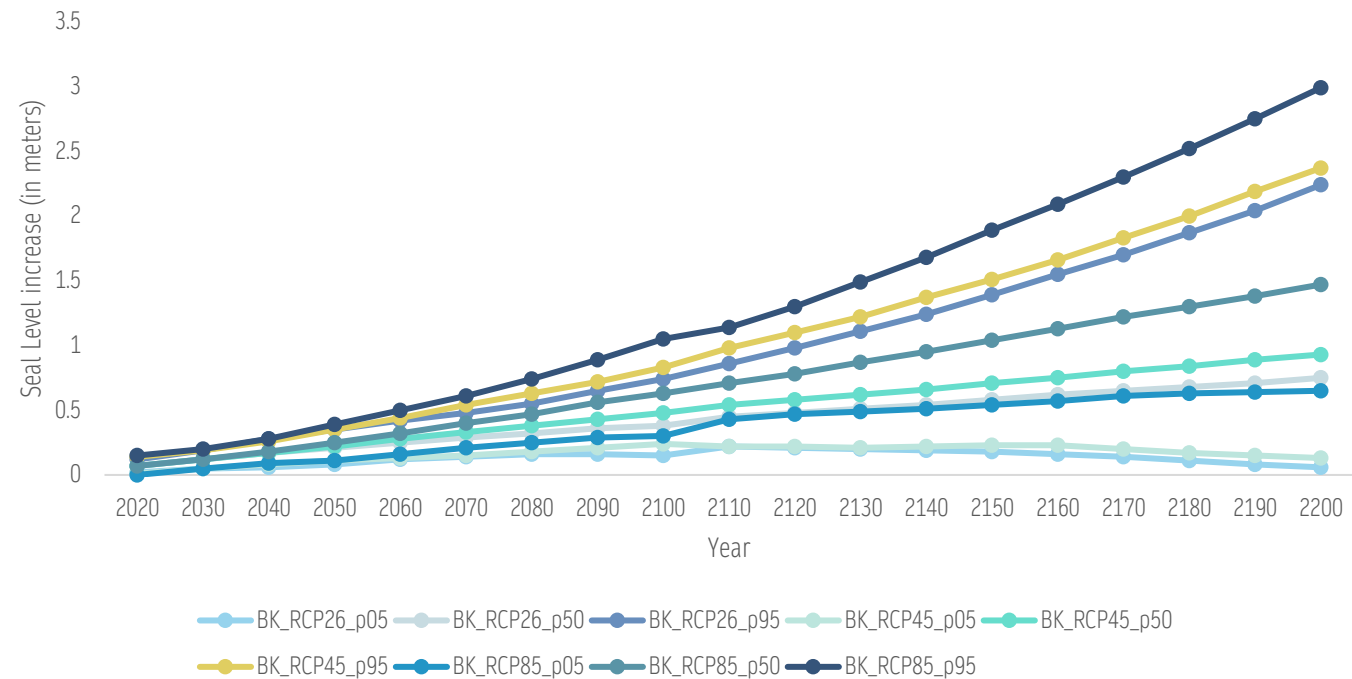
[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org/surging-seas-risk-zone-map)

[\(1\) Met Office: UK sea level rise speeding up - YouTube](#)

SLR projections in the Mumbles

- Click on the 'Get more data' link
- Fill in the form to access and download the raw data for this projection risk map
- Plot the data from Table 0 graphically using the software of your choice (e.g. Excel).
- You will likely need to do some data cleaning and reformatting of the .txt formatted data.

Projections of Sea Level Rise for the Mumbles

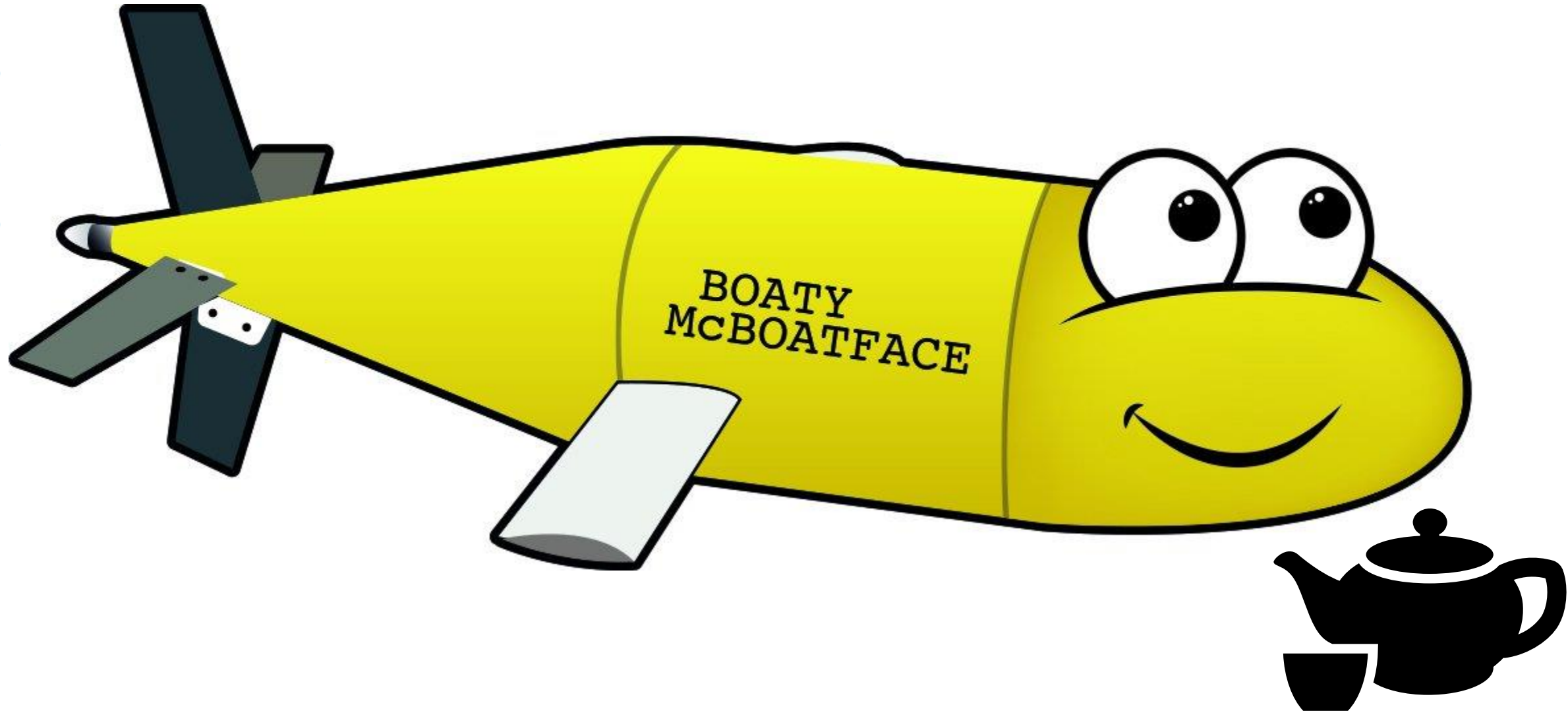


[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org)

[\(1\) Met Office: UK sea level rise speeding up - YouTube](#)

TAKE A BREAK

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DPSIR Framework

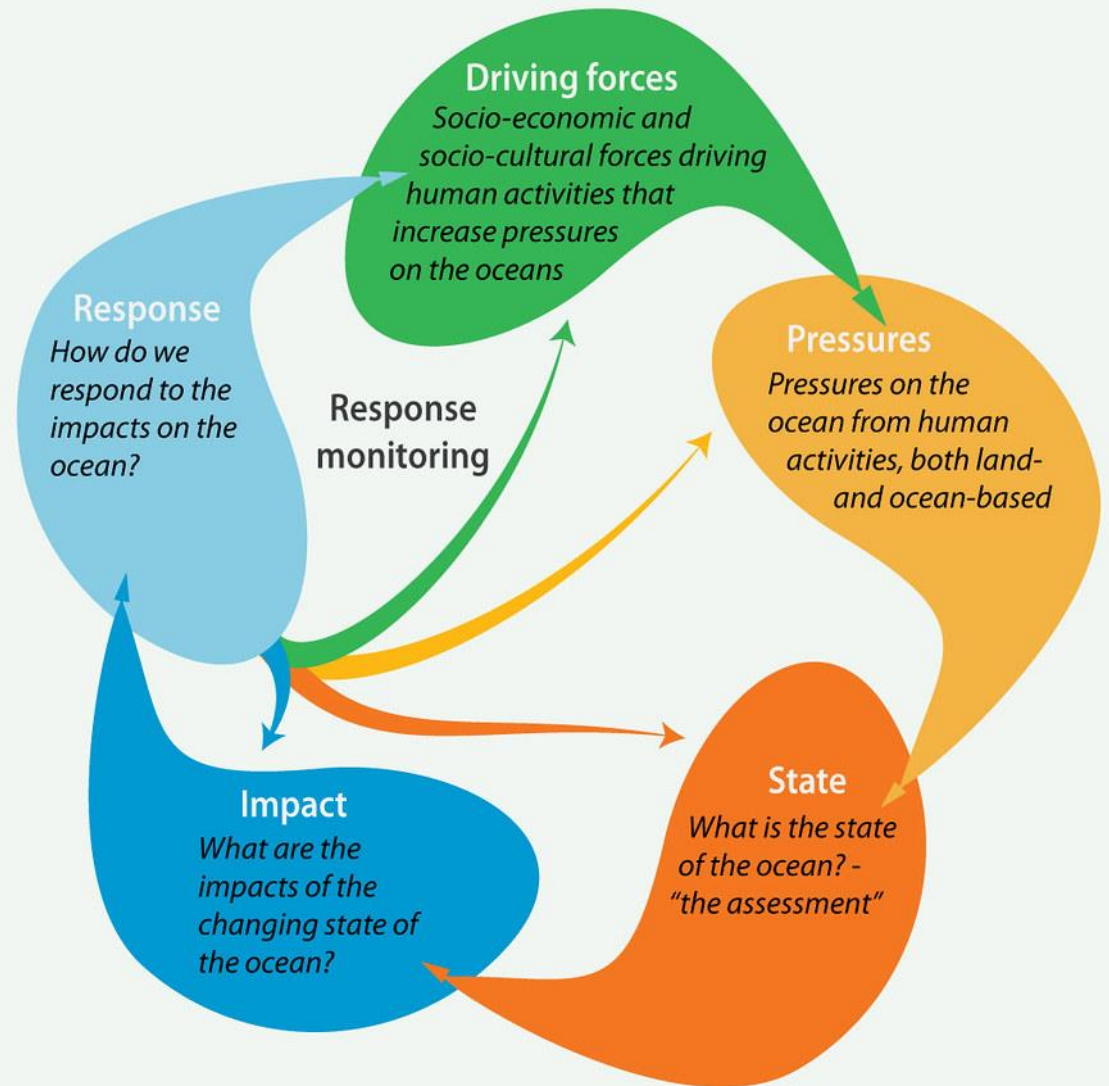
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The DPSIR framework (Driving Forces-Pressures-State-Impacts-Responses) is used to assess and manage environmental problems.

[The levels of DPSIR framework | GRID-Arendal \(grida.no\)](http://grida.no)

The levels of DPSIR framework

- Driving forces - Pressures - State (of the oceans) - Impacts - Responses



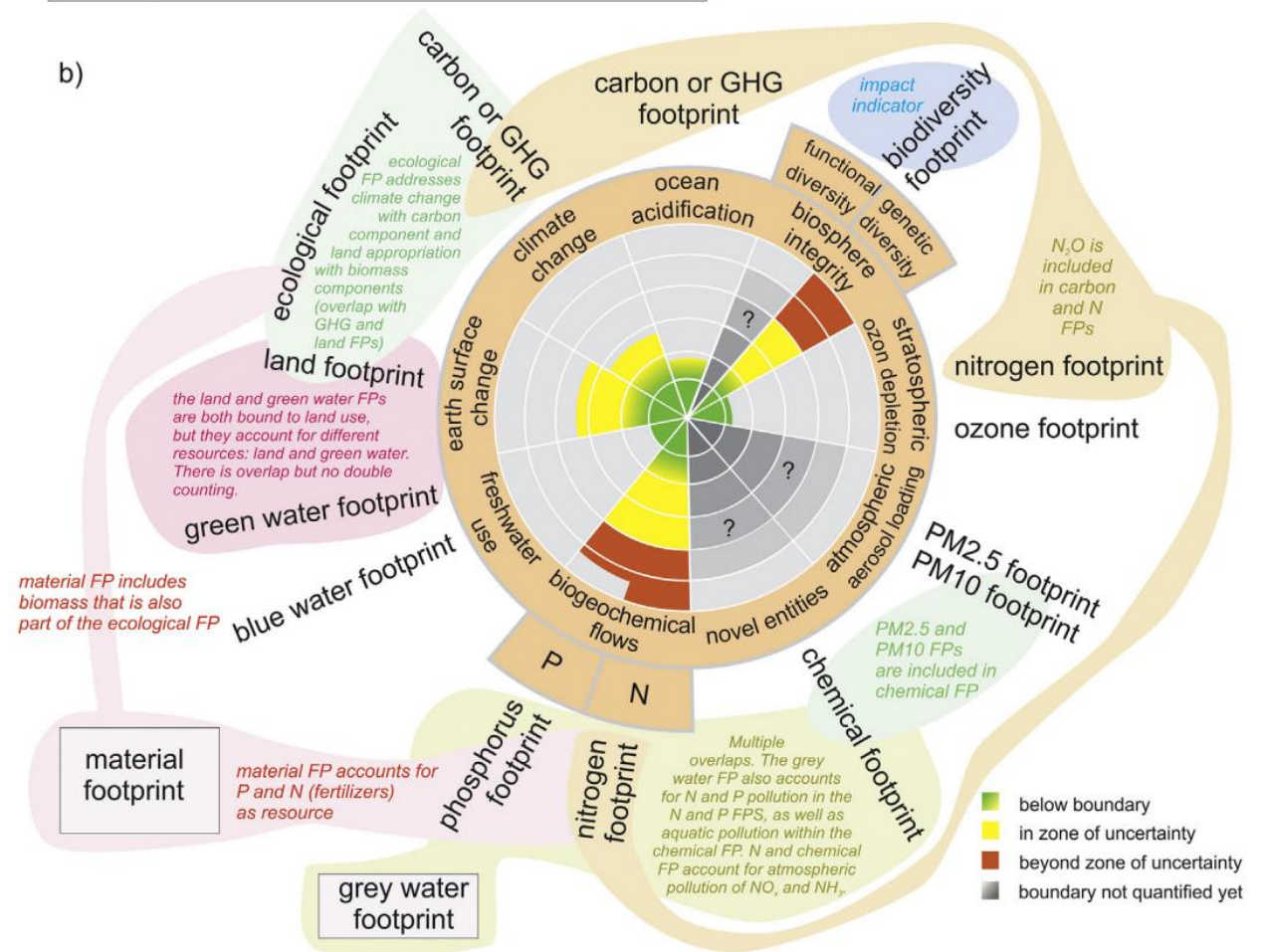
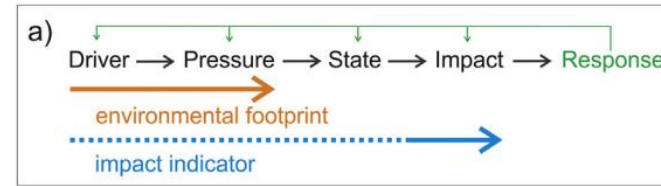
DPSIR Framework

- **Driving forces** are the socio-economic and socio-cultural forces driving human activities, which increase or mitigate pressures on the environment.
- **Pressures** are the stresses that human activities place on the environment.
- **State**, or state of the environment, is the condition of the environment.
- **Impacts** are the effects of environmental degradation.
- **Responses** refers to the responses by society to the environmental situation.

DPSIR Framework

(PDF) Environmental footprint family to address local to planetary sustainability and deliver on the SDGs (researchgate.net)

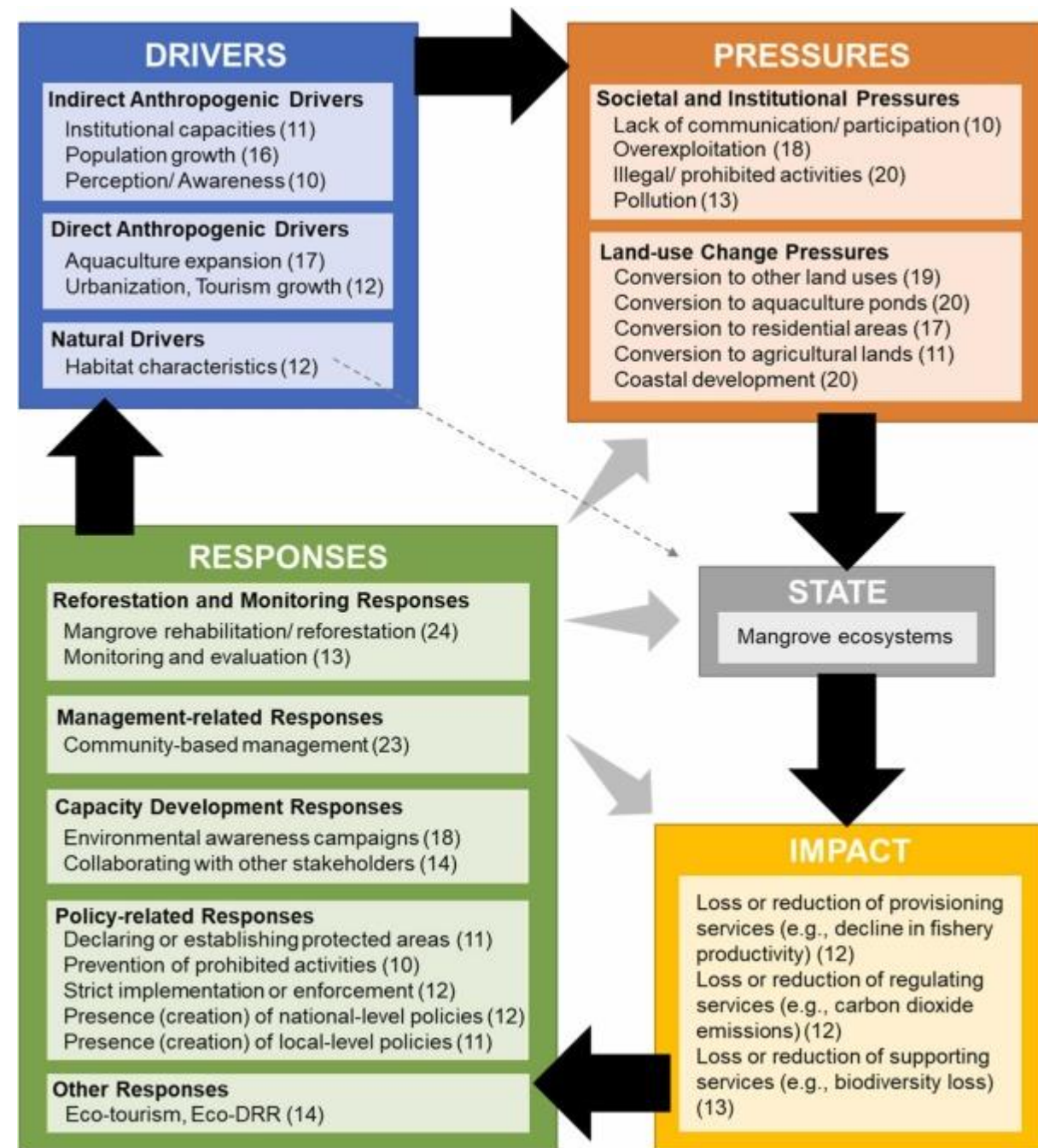
Linear representation of the DPSIR framework (drivers, pressure, state, impact and response) (OECD, 2003) and its theoretical relationship with environmental footprints and impact indicators.

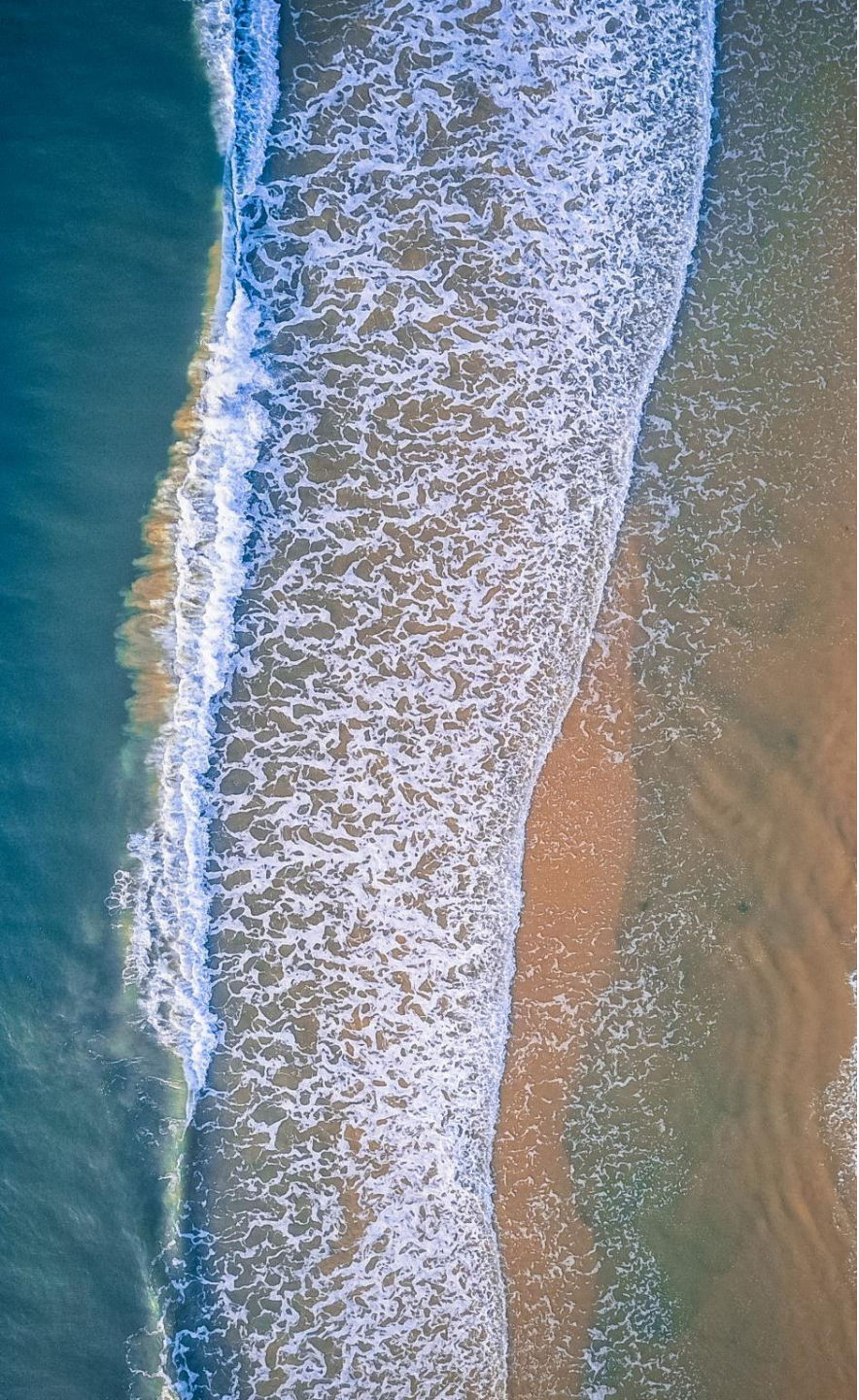


DPSIR Framework

[Applying the DPSIR framework to qualitatively assess the globally important mangrove ecosystems of Indonesia: A review towards evidence-based policymaking approaches - ScienceDirect](#)

The DPSIR framework of Indonesia. The number in parenthesis indicates the number of provinces mentioning the component. The D, P, I, and R components with at least 10 provinces are reflected in this figure.





Shoreline management plans

- Shoreline Management Plans (SMPs) set out a shared strategic approach for managing the coastline from [coastal flooding](#) and [erosion risks](#). Their aim is to reduce the risks to people, the developed, historic and natural environments over the next century.
- A long-term perspective is fundamental to Shoreline Management Plans so that implications of coastal change can be identified.
- In some areas there is a need to continue to defend the coastline from flooding and erosion. In other areas, sections of the coast will be allowed to evolve naturally to adapt to changing environmental conditions.



Shoreline management plans

- The choice of Shoreline Management Plan policy for a section of coast is informed by a review of available evidence and an assessment of:
- coastal processes
- coastal flood and erosion risks
- coastal defence condition
- policy development testing and appraisals
- environmental impacts informed by Habitat Regulations Assessment, Strategic Environmental Assessment, Water Framework Directive Assessment
- social factors
- economic appraisal
- climate change
- local factors
- interactions with neighbouring areas



Development of shoreline management plans

- Shoreline Management Plans have been developed by Coastal Groups, whose members include:
 - Natural Resources Wales
 - Maritime local authorities
 - government bodies
 - other stakeholders with a responsibility or interest in managing the coast
- The Plans have been subject to peer review and public consultation. Coastal Groups then agreed the Plans, which were also approved by local council cabinets before they were signed off by the Welsh Government.
- Shoreline Management Plans aren't statutory documents, but the Welsh Government want to see them considered both in local decision-making and strategic planning, such as Local Development Plans and Local Flood Risk Management Strategies produced by local authorities.

Managing sections of the coast

- Shoreline Management Plans split the coastline into small sections (called policy units) and describe how these sections will be managed over the:
 - short-term (2005-2025)
 - medium-term (2025-2055)
 - long-term (2055-2105)
- There are four approaches that can be applied to each policy unit, for each period of time, including:

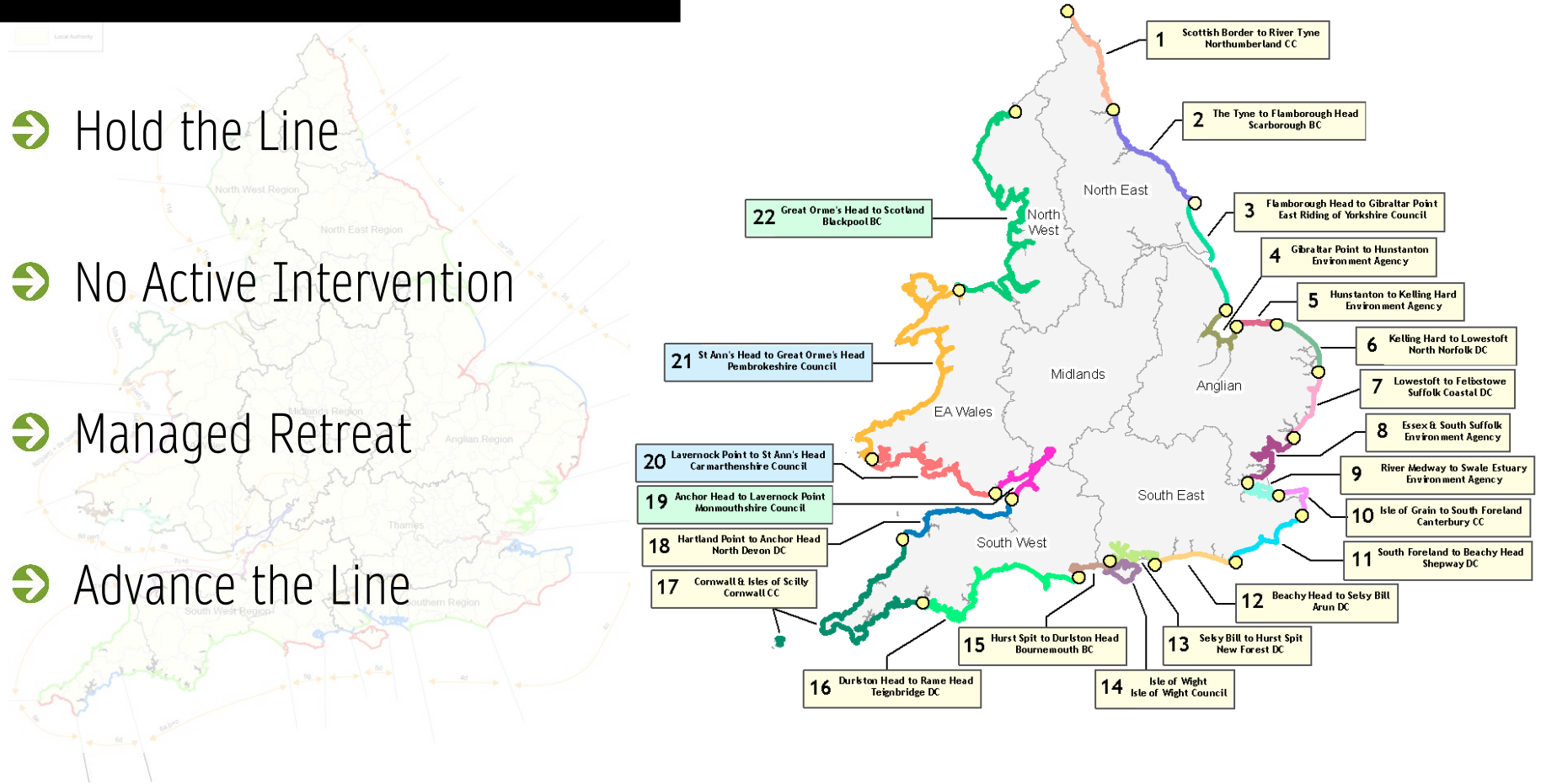
4 approaches

- There are four approaches that can be applied to each policy unit, for each period of time, including:
- **Hold the line** (HTL) by maintaining or changing the existing standard of protection
- **Advance the line** (ATL) by building new defences on the seaward side of the original defences (although none applied in Wales)
- **Managed realignment** (MR) which allows the shoreline to move backwards and forwards, with management to control or limit the movement
- **No active intervention** (NAI) where there is no investment in coastal defences and natural processes are allowed to continue to create an evolving coastline

Shoreline management plans

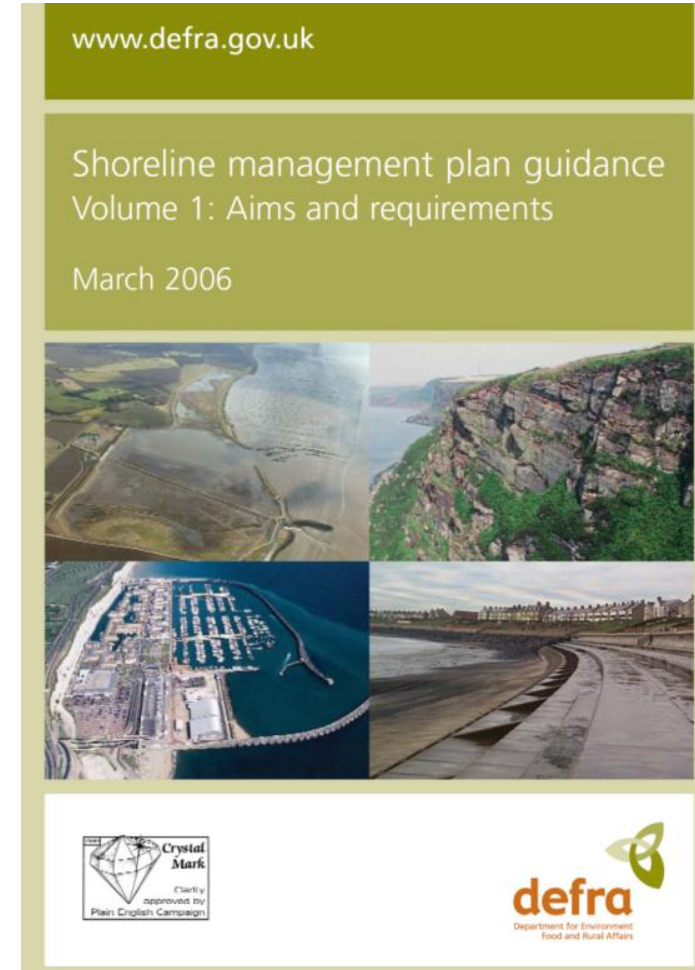
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- ➔ Hold the Line
- ➔ No Active Intervention
- ➔ Managed Retreat
- ➔ Advance the Line



Shoreline management plans

- Not development plans, and not statutory
- ➔ Intensive public engagement and consultation
- ➔ Long-term - set the 'direction of travel'
- ➔ Can be challenged, changed and are subject to funding availability
- ➔ Use consistent data sets informed by local expertise



Challenges for the strategic approach

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01

Engaging people about long term risk – 20 years as 'short term'

02

Empowering people to make decisions on sound but changing evidence

03

Encouraging investment security whilst retaining flexibility

04

Keeping strategic plans 'living' and active

05

Communicating uncertainty whilst maintaining authority

06

Giving people options now to change in the future

Other adaptation considerations

Roll-back:

- ➔ Is land available, is it cost-effective, is it technically feasible?

Relocation:

- Homeowners were not always happy with new plots
- ...and didn't always want to move as a 'community'
- Replacement plots sometimes contested by residents

Buy-and-lease:

- ➔ Large initial outlay for local authority, slow unpredictable returns
- ➔ Setting fair payments without 'compensating' is difficult

Managed re-alignment:

- ➔ Working with natural processes vs biodiversity/ecosystem function
- ➔ Often seen as a threat by communities – engagement intensive
- ➔ Controversy surrounding 'food security', budget use, landscape etc

Activity

- Activity: Click on the following link:

[Flood and Coastal Erosion Risk Maps \(naturalresources.wales\)](https://naturalresources.wales)

Apply the **DPSIR Framework** to a region that has a SMP in Wales. Do you agree with the selected responses?

[Atlantic Ocean circulation nearing 'devastating' tipping point, study finds | Oceans | The Guardian](#)

[Surging Seas: Risk Zone Map \(climatecentral.org\)](https://climatecentral.org)

SEA LEVEL RISE

[Atlantic Ocean circulation nearing 'devastating' tipping point, study finds | Oceans | The Guardian](#)

- What do different rising sea levels mean a) globally and b) locally to Wales?