

Transitions to a lower risk coast: Resilience in the face of sea-level rise



Project Background

- A one year project funded by NERC to examine coastal resilience
- One of 19 projects funded by the Strategic Priorities Fund: UK Climate Resilience – diverse set of projects
- Duration 1 February 2019 to 31 January 2020.
- Synergistic with the SMP2 Refresh, but going well beyond – this is a research project.



Project aim

To develop and demonstrate prototype methods to assess realistic pathways for strategic coastal erosion and flood resilience in the light of climate change, including sea-level rise.

(Links to Shoreline Management Planning)

Objectives

- i. To consider coastal archetypes that define the coast.
- ii. To evaluate adaptation options in the context of broader changes in shoreline management planning
- iii. To analyse joined-up decision making and adaptation pathways enhance resilience based on the menu of adaptation options.

Cross-cutting stakeholder engagement



What is resilience?

1. the capacity to recover quickly from difficulties; toughness.
2. the ability of a substance or object to spring back into shape; elasticity.

Source: The Oxford Dictionary

A system (or integrative) concept



Resilience to hazards and climate change

Increasingly used as a concept, as opposed to traditional protection or hold the line.

However, often ill-defined or implicit, and not immediately clear how to operationalize in practise.

This reflects that this is difficult.



Resilience definitions

“The concept of resilience is understood differently by different academic communities and practitioners. Here, the programme takes a broad perspective of climate resilience that encompasses capacity to adapt to, anticipate and absorb climate variation and extremes, to enable incremental to transformational change. (Bene et al., 2012)”

Source: Strategic Priorities Fund: UK Climate Resilience Programme



Resilience definitions

“Resilience – the capacity to anticipate and plan for disturbances, resist damages and/or absorb impacts, rapidly recover afterwards, and adapt to stressors, changing conditions and constraints”

“Coastal resilience is defined as the ability of a system to prepare, resist, recover, and adapt to disturbances in order to achieve successful functioning through time (Rosati et al., 2015).”

Source: US Army Corps of Engineers



Project Team

Southampton:

- Robert Nicholls
- Ian Townend
- Emma Tompkins
- Eli Lazarus
- Ivan Haigh
- Sally Brown
- Natalie Suckall
- Chris Hill
- Stephen Carpenter

UCL

- Jon French

Middlesex

- Edmund Penning-Rowsell

Project Partners

- ABPmer
- Coastal Group Network
- National Trust
- RSPB
- Wildfowl and Wetlands Trust
- National Flood Forum
- Natural England
- Network Rail

Channel Coastal Observatory

- Charlie Thompson



Stakeholder activities and workshops

- National Workshop Examining National Experience
- Regional Workshops Examining Practitioner Experience in Havant (near Portsmouth) and York.
- Discussions with selected stakeholders to fill gaps from the workshops.



Key results to date (1)

From three stakeholder workshops focusing on coastal flood and risk management and shoreline management planning we found:

- There is widespread agreement on the need to improve coastal planning and management, even for current sea-level and climate conditions. Future challenges, especially in relation to large storm events and long-term climate change remain highly uncertain.
- Many incremental improvements of the existing approach are possible, such as explicit consideration of rapid and slow policy transitions and how to achieve them.
- In terms of the concept and practise of coastal resilience, there is considerable disagreement across stakeholders on what this means and how this might be applied. This will be discussed in Session 2.



Key results to date (2)

Moving the concept of Coastal Resilience forward (Sessions 2 and 3):

- A high level understanding of coastal resilience to floods and erosion has been developed.
- This concept of coastal resilience can be measured with appropriate data and hence operationalized for policy application.
- The policy options (or “building blocks”) to deliver this type of approach to coastal resilience already exist in the UK and can be derived from existing EA and DEFRA policy suggestions.
- This has important implications for issues such as coastal data collection and monitoring, and also coastal governance



Aims of today

1. Explore risk and resilience in the coastal areas of England and Wales.
2. Our method to challenging existing approaches to delivery of resilience through shoreline management planning designations.
3. New method to characterise coastal resilience – Three illustrative cases.



Guided by consultations



e.g., Environment Agency
Draft National Flood and Coastal
Erosion Risk Management Strategy
for England

Figure 1: The elements of the national flood and coastal erosion risk management strategy

Tools used to achieve place based resilience standards



Figure 8: Tools used to achieve place based resilience standards



Workshop format

- Three sessions with short presentations and one longer presentation.
- Breakout groups (we have assigned you to groups)
- Nominated rapporteur reports back
- Ethics – you have all been asked to sign a consent format --- we will take notes – nothing is attributed to individuals



Agenda

Session 1: Risk and resilience in the coastal areas of England and Wales

Session 2: Reframing resilience to coastal flooding and erosion

Session 3: A new method to characterise coastal resilience

Lunch: 1pm (45 mins)

Afternoon break: 3pm

Meeting close: 4pm



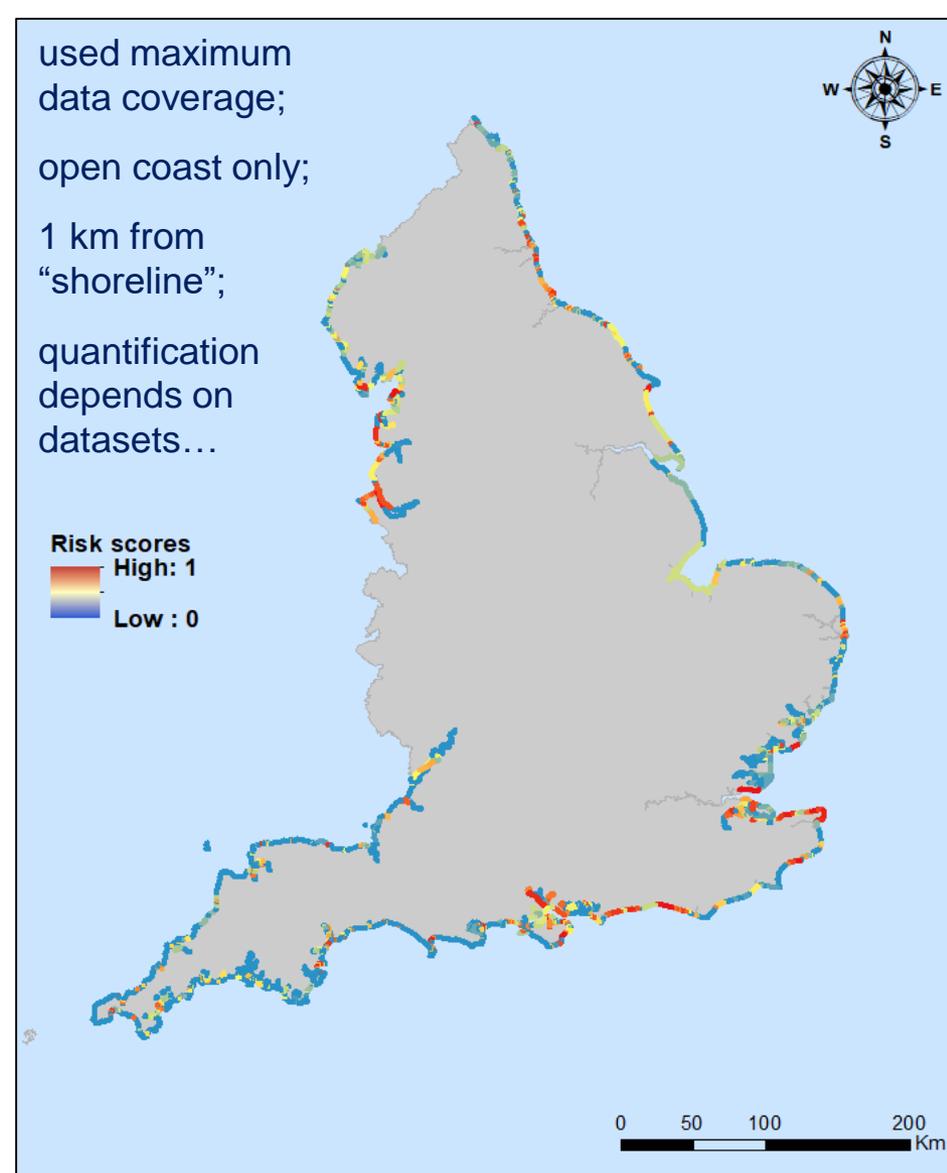
Session 1: Risk and resilience in the coastal areas of England and Wales

Chair: Jon French. Presentation: Eli Lazarus



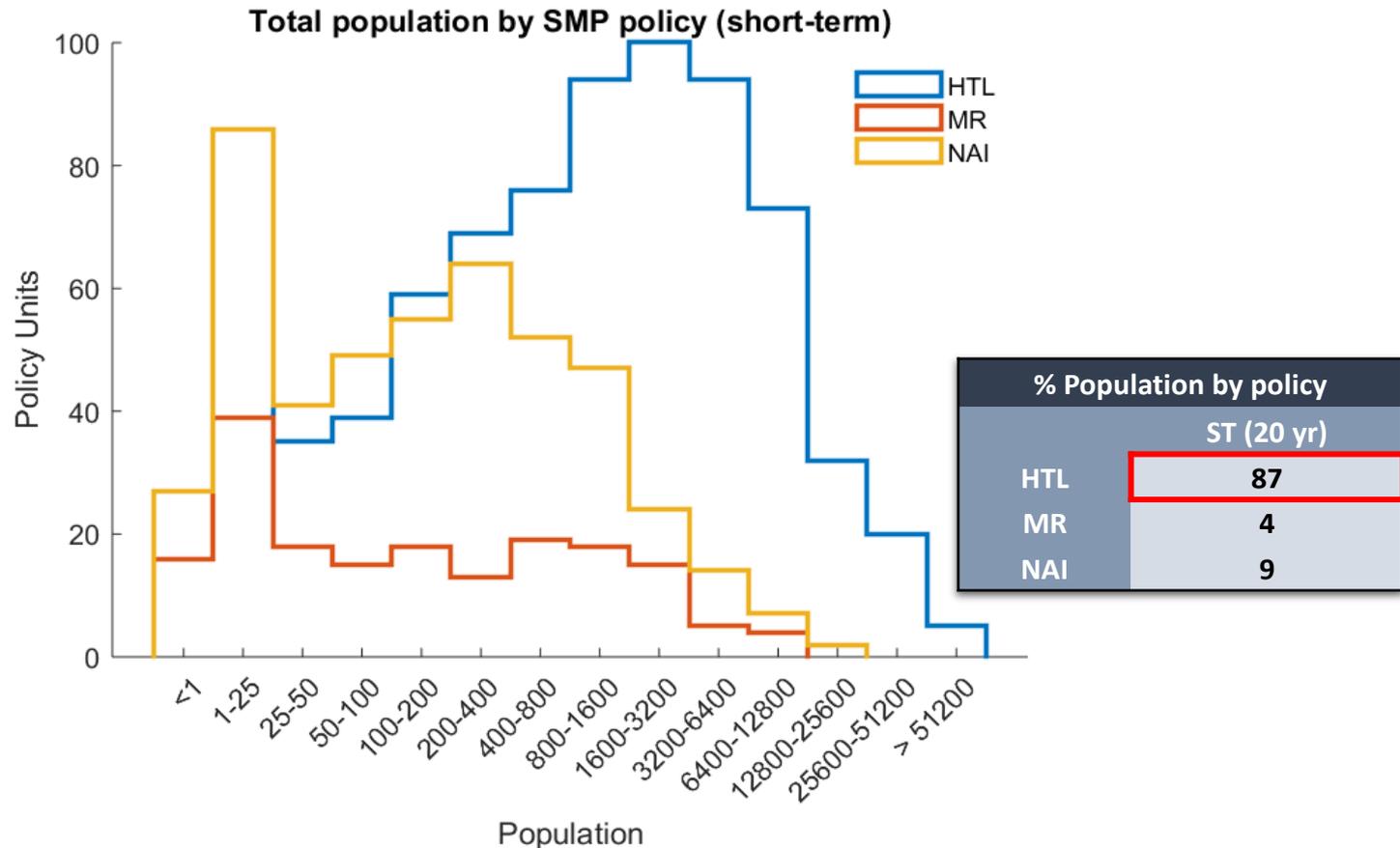
Coastal risk (with a view toward resilience) in England: empirical analysis

- Sofia Aldabet & Eli Lazarus with support from GeoData
- **RISK = Hazard x Exposure x Vulnerability**
- How can we look at this metric in a different way?
- What might we see?



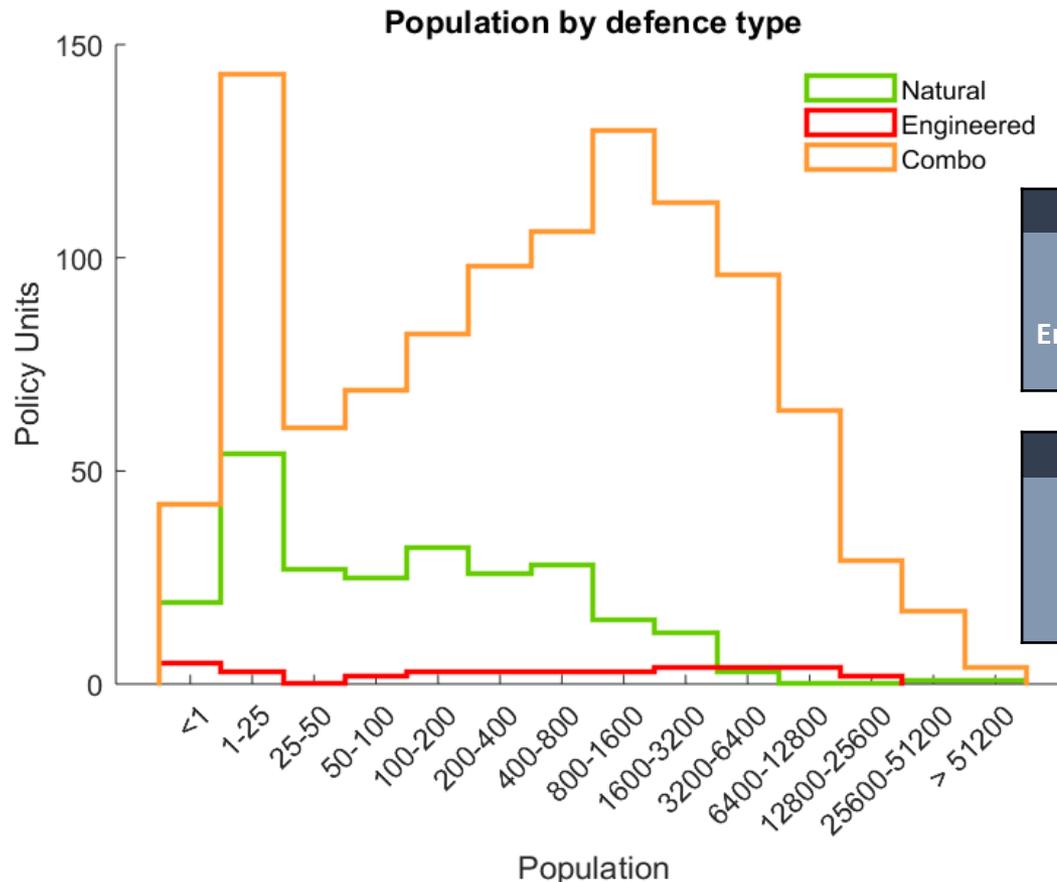
These outputs are preliminary, and are illustrative of the research problem being undertaken,

Most people in coastal England live behind a "hold-the-line" policy...



These outputs are preliminary, and are illustrative of the research problem being undertaken,

...and most people live behind combination of natural & engineered defences

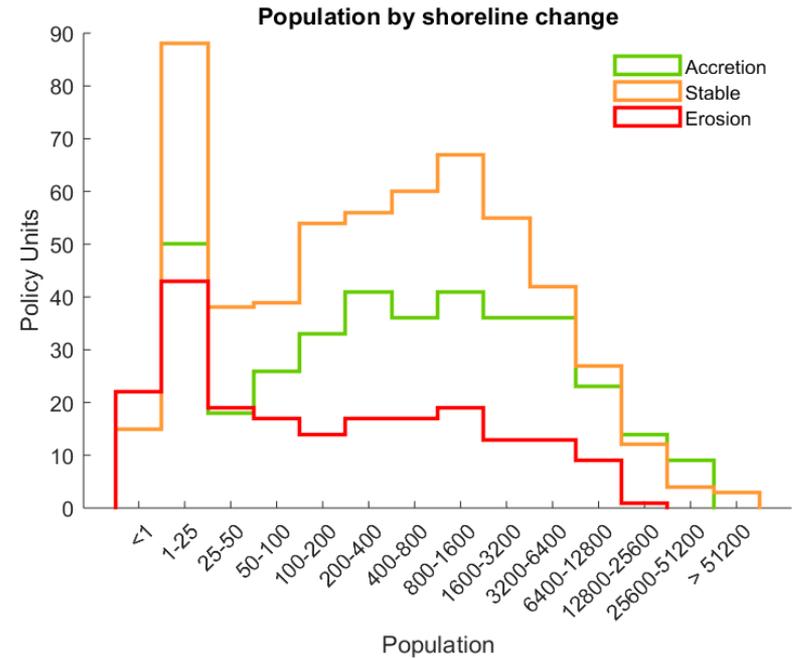
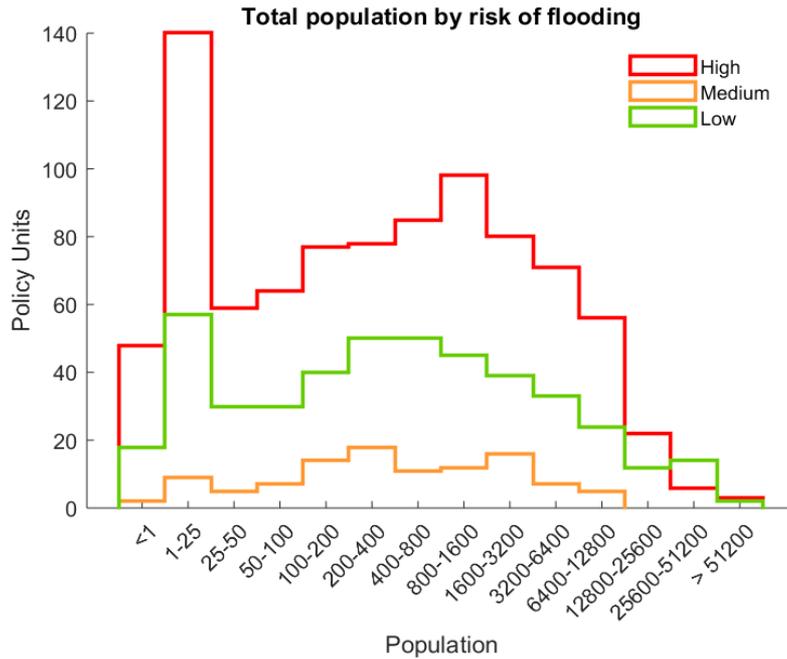


Population by defence type		
	Total Pop	%
Natural	188,643	5
Engineered	114,713	3
Combo	2,847,963	81

Buildings by defence type		
	Number	%
Natural	45,552	6
Engineered	23,493	3
Combo	585,115	79

These outputs are preliminary, and are illustrative of the research problem being undertaken,

More people are at high risk of flooding than of shoreline erosion...



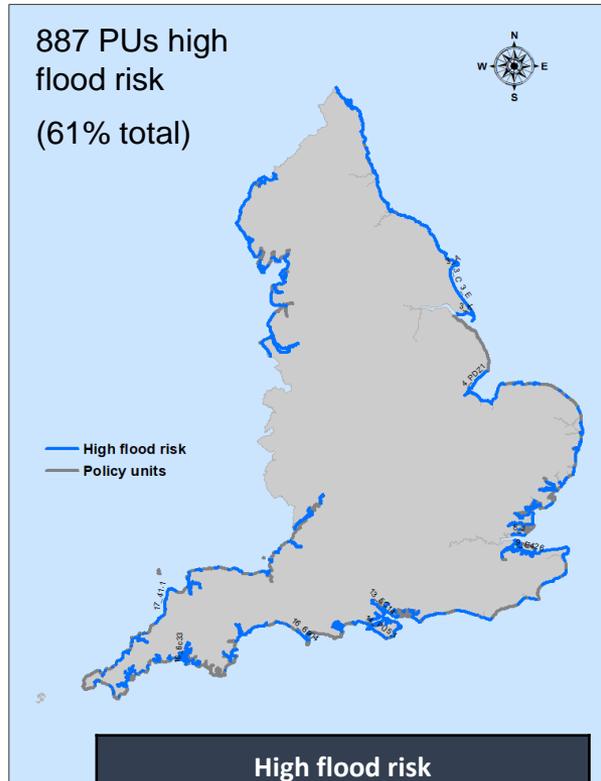
% Population by risk of flooding	
High	58
Medium	4
Low	37

% Population by shoreline change	
Erosion	6
Stable	36
Accretion	31

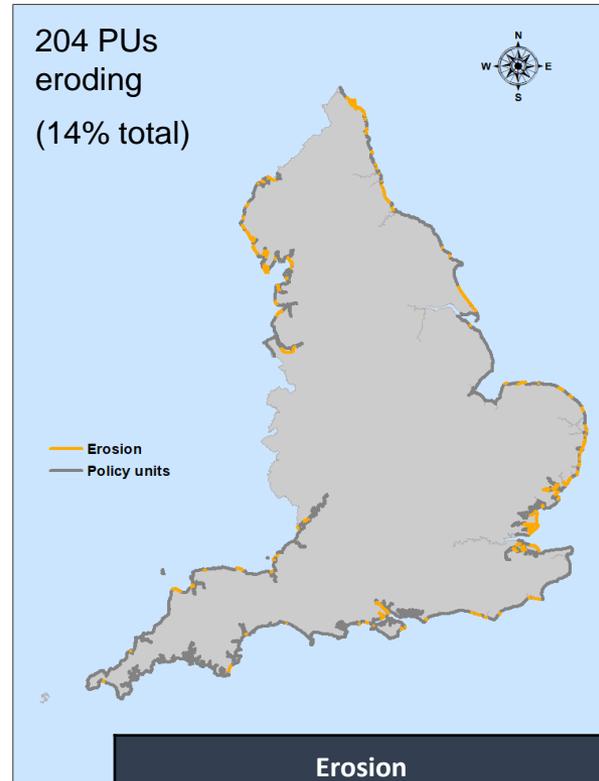
These outputs are preliminary, and are illustrative of the research problem being undertaken,

...but in some places, people are exposed to BOTH hazards

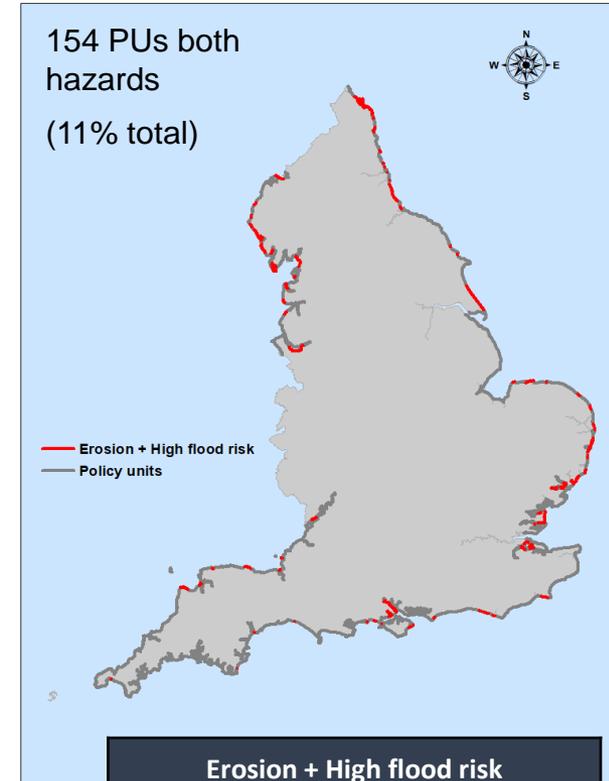
75% eroding PUs also high flood risk



High flood risk		
	Population	Buildings
Total	2,023,623	423,286
%	58	57



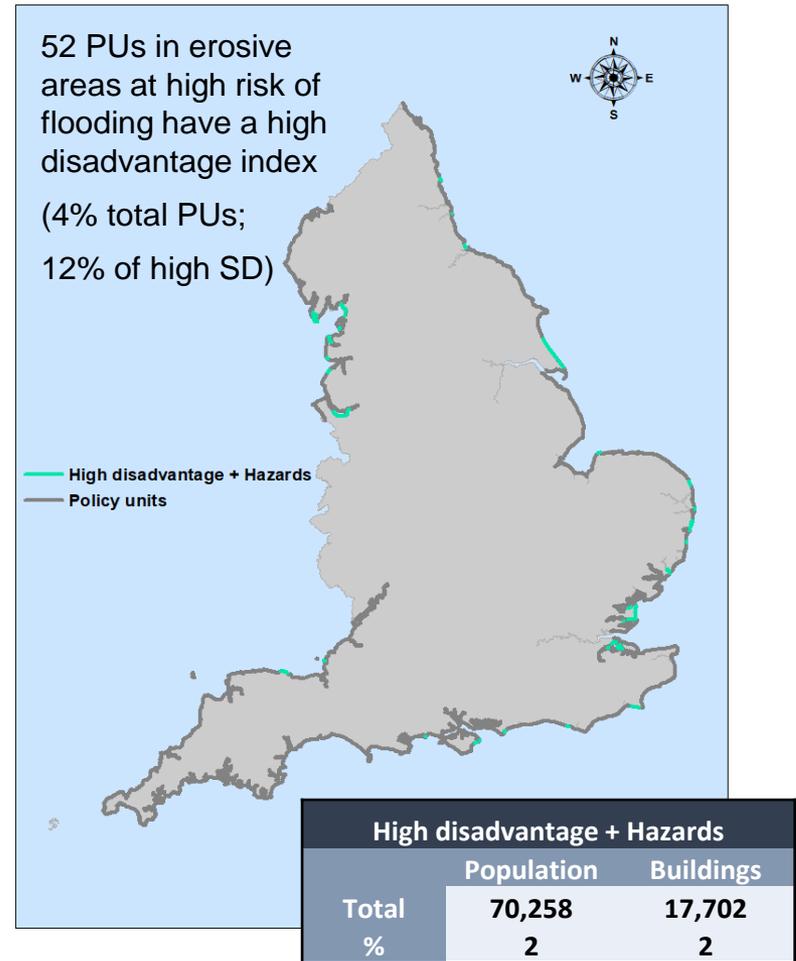
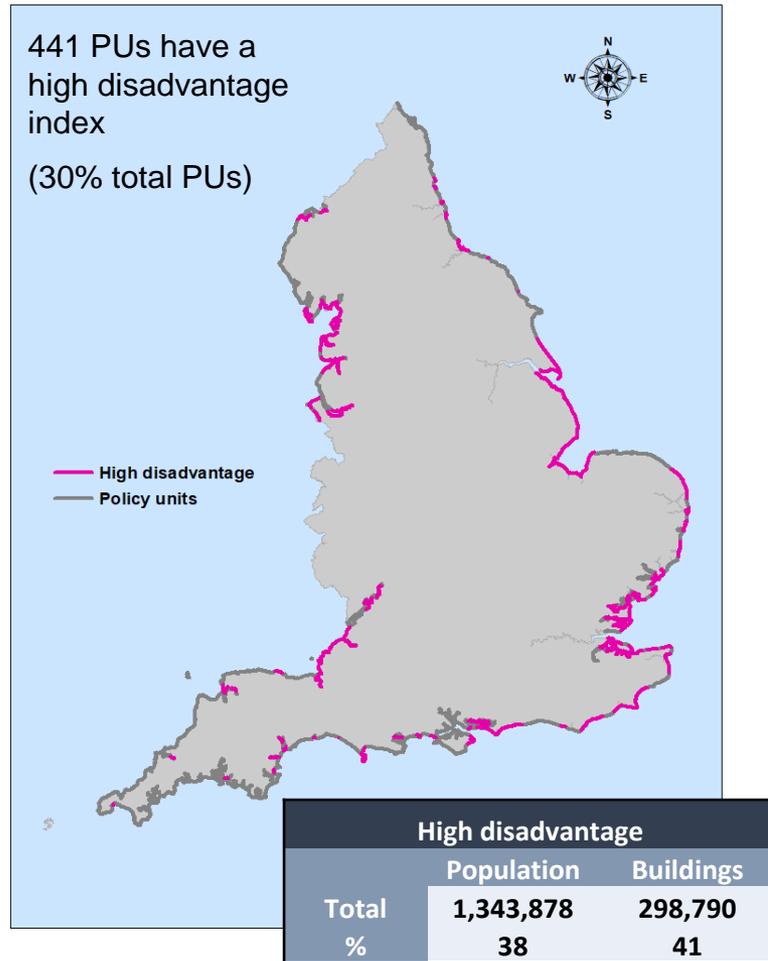
Erosion		
	Population	Buildings
Total	223,390	58,457
%	6	8



Erosion + High flood risk		
	Population	Buildings
Total	178,031	42,752
%	5	6

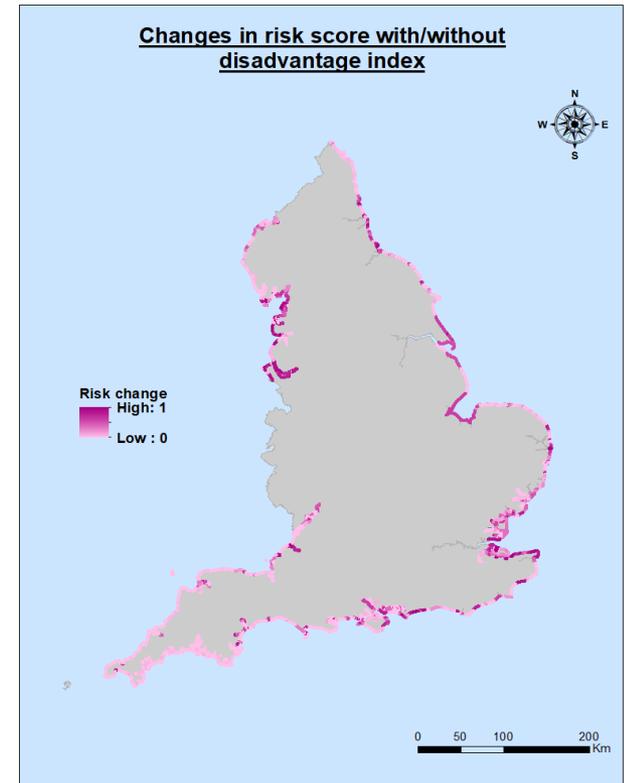
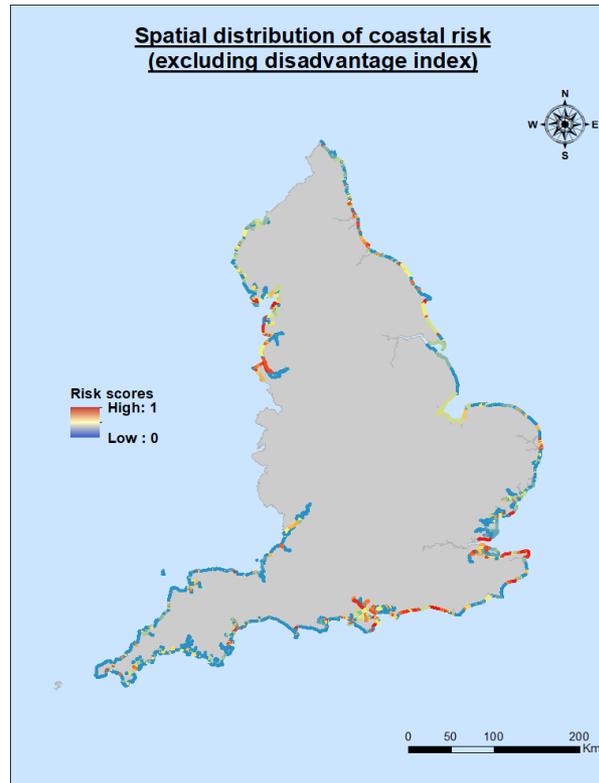
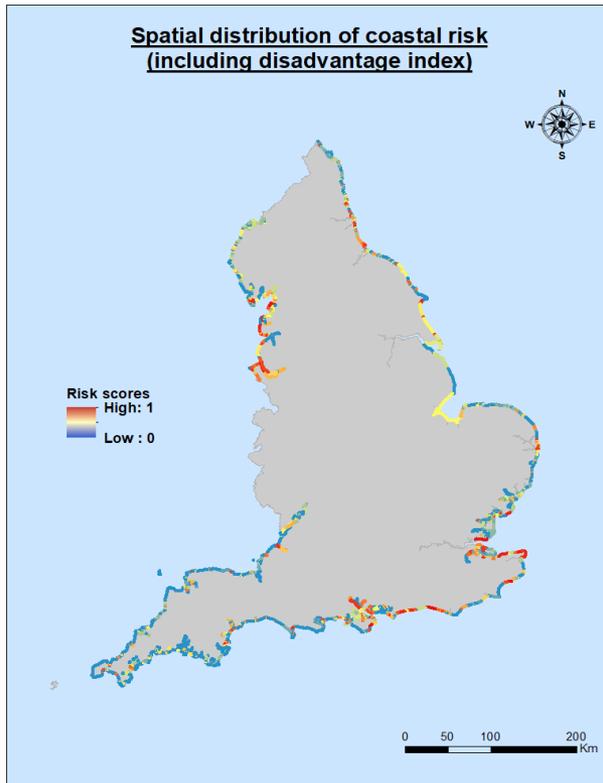
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Who is exposed? (add social disadvantage)



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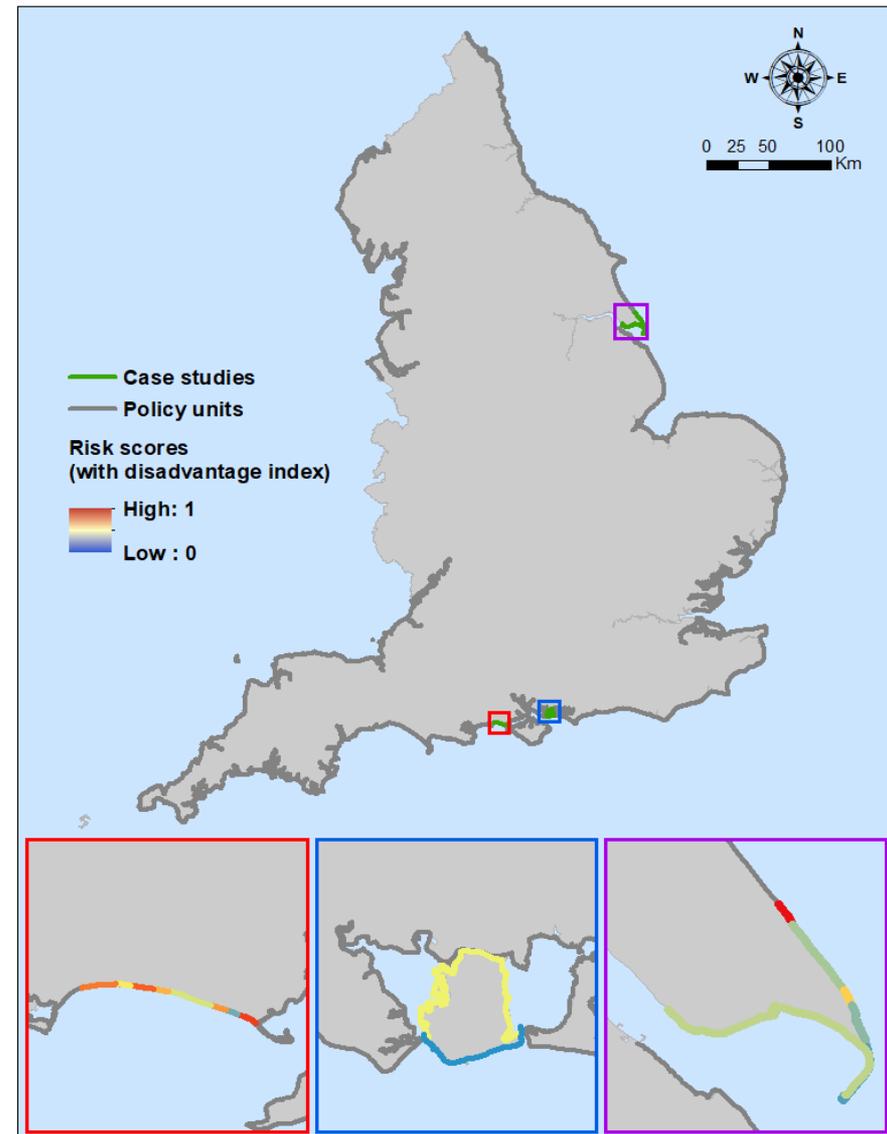
Including social disadvantage changes the risk (and resilience) picture



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Mapping resilience?

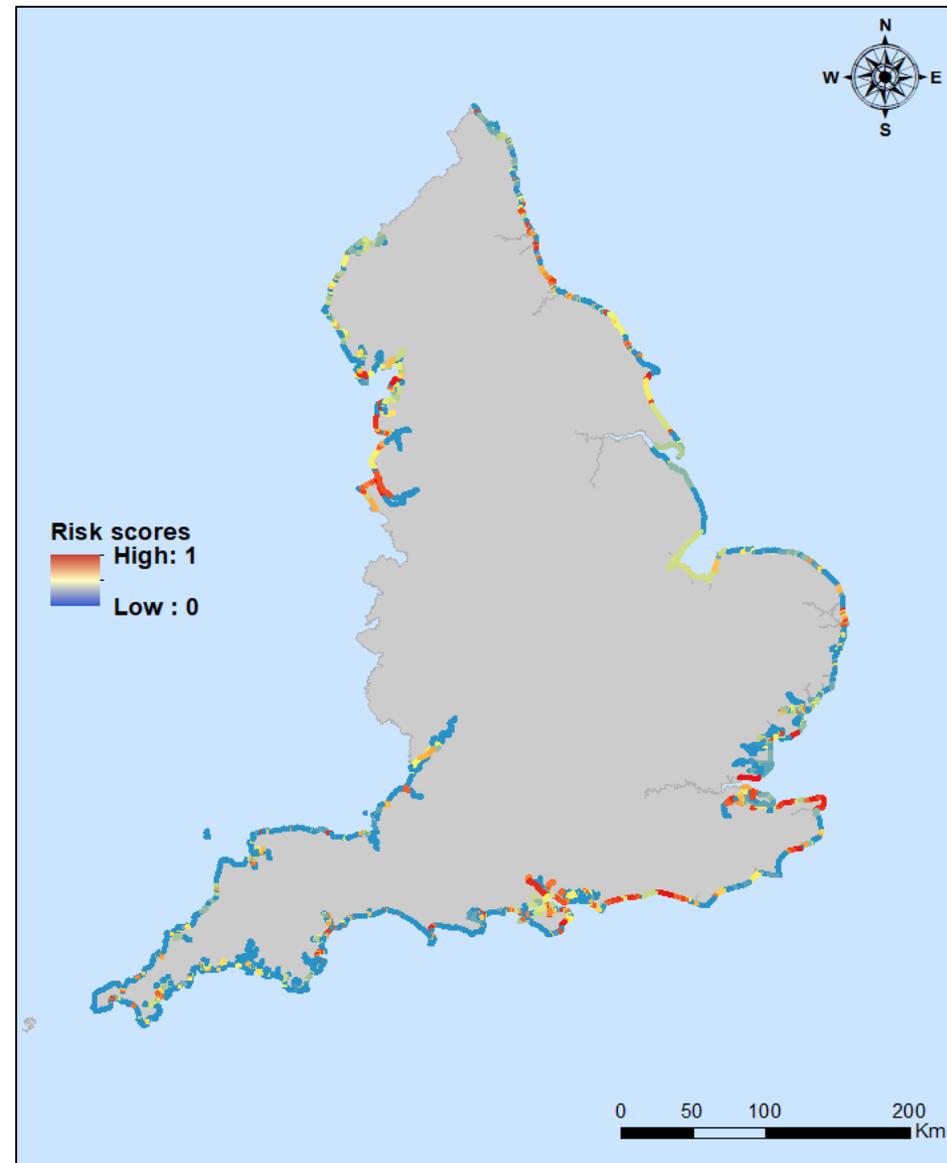
- will explore through case studies in **Session 3**



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Questions for you:

- In your work and experiences, what challenges come with including metrics of social disadvantage in assessments of risk?
- What are the “social” datasets that YOU use?
- What are the social datasets you WISH you could use?



These outputs are preliminary, and are illustrative of the research problem being undertaken,

Breakout groups



Breakout groups:

What are the challenges of producing national risk maps?

- All groups (20 mins)
 - Suggested discussion points are below
 - Rapporteurs will agree key points at end
1. What are the challenges of taking this integrated physical and social perspective of risk at the coast?
 2. We used the deprivation index to measure social dimensions - what other measures, indices or approaches might be used?
 3. How do these risk approaches inform and frame thinking about moving from coastal defence to coastal resilience?



Session 2: Reframing resilience to coastal flooding and erosion

*Chair: Edmund Penning-Rowsell. Presentations:
Emma Tompkins, Robert Nicholls*



Purpose of session

- Aim: to introduce our reframing of coastal resilience
- To consider how resilience is used in multiple policy documents that focus on 'coastal resilience' or 'flood resilience'
- To explain how resilience was used by CoastRes workshop participants
- To present our functional definition of resilience and how to measure it (Robert)



Some common uses of coastal resilience in UK policy making

- DEFRA guidance on 'Flood and Coastal Resilience Partnership Funding 2011'
 - Resilience not defined, appears synonymous with **risk reduction**
- DEFRA 'Flood Resilience Community Pathfinder Evaluation Final Evaluation Report, 2015':
 - Community resilience is: Communities working with local resources (information, social capital, economic development, and community competence) alongside local expertise (e.g. local emergency planners, voluntary sector, local responders) to help themselves and others to prepare and respond to, and to recover from emergencies, in ways that sustain an acceptable level of community functioning
 - **Communities more active in collaborative risk reduction**



Climate Change Committee on resilience

- Managing the coast in a changing climate (2018)
 - Frequent reference to need for long term resilience
 - Specific information given on meaning of, and methods to achieve property level resilience
- DEFRA 2018 The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting
 - Not defined



Uses of resilience in UK policy

- HMG National Flood Resilience Review 2016
 - Resilience not defined
 - Resilience is ensuring security under a range of disruptive risks?
- EA 'Draft National Flood and Coastal Erosion Risk Management Strategy for England' 2019
 - Introduces suite of resilience tools
 - “Resilience includes accepting that in some places we can’t eliminate all flooding and coastal change, and so we need to be better at adapting to living with the consequences.”
 - Resilience is about living with change?



CoastalRes workshops 2019

1. No reference to resilience to erosion, most often resilience to flooding
2. SMPs are not designed to deliver coastal resilience
 - *“At the flood and coastal conference we spoke about resilience and adaptation and this is outside the scope of the SMPs” (R2_NDPB_2)*
 - *In SMPs it [resilience] would be difficult to incorporate. (R2_NDPB_1)*



Understanding of resilience is not universal

3. Resilience meaning is not widely agreed, and sometimes not understood

- *“You use local resilience. What do you mean?... You don’t have local resilience, you have people losing their houses. You move them out before their lose their lives. Don’t hide behind the terms, that are a too large a word to have any meaning” (R2_PS_1)*
- *“You mentioned about resilience. This is a new theme. Its not used in planning. What does it mean and how do we measure it?” (R2_NDPB_1)*



So what...conclusions

- No mention of erosion resilience – not considered?
- Resilience often used vaguely without a ‘who’ or ‘to what’
- Resilience covers multiple and sometimes conflicting objectives
- SMPs were not designed to deliver coastal resilience
- Need for a clear objective for resilience that can be operationalised:



Reconsidering coastal resilience

- Resilience is complex and likely to entail trade offs
- Resilience to floods and erosion in the coastal zone comprises:
 - ***“minimising damage to health, assets, the economy and the natural environment; reducing residual risk; and maximising community preparedness.”***
- How can this be operationalised?
- ...Over to Robert



Context

- Existing Shoreline Management Planning arrangements
- Concern about climate change and sea-level rise
- Other changes – such as coastal deprivation

Ambition

- Potential to deliver three related but distinct outputs:
 - ‘State of the Nation’ assessment of national coastal resilience
 - Examination of different national choices about resource allocation
 - Selection of local policy options to enhance coastal resilience

Reality in this project

- Conceptual framework
- Three illustrative studies at the local level



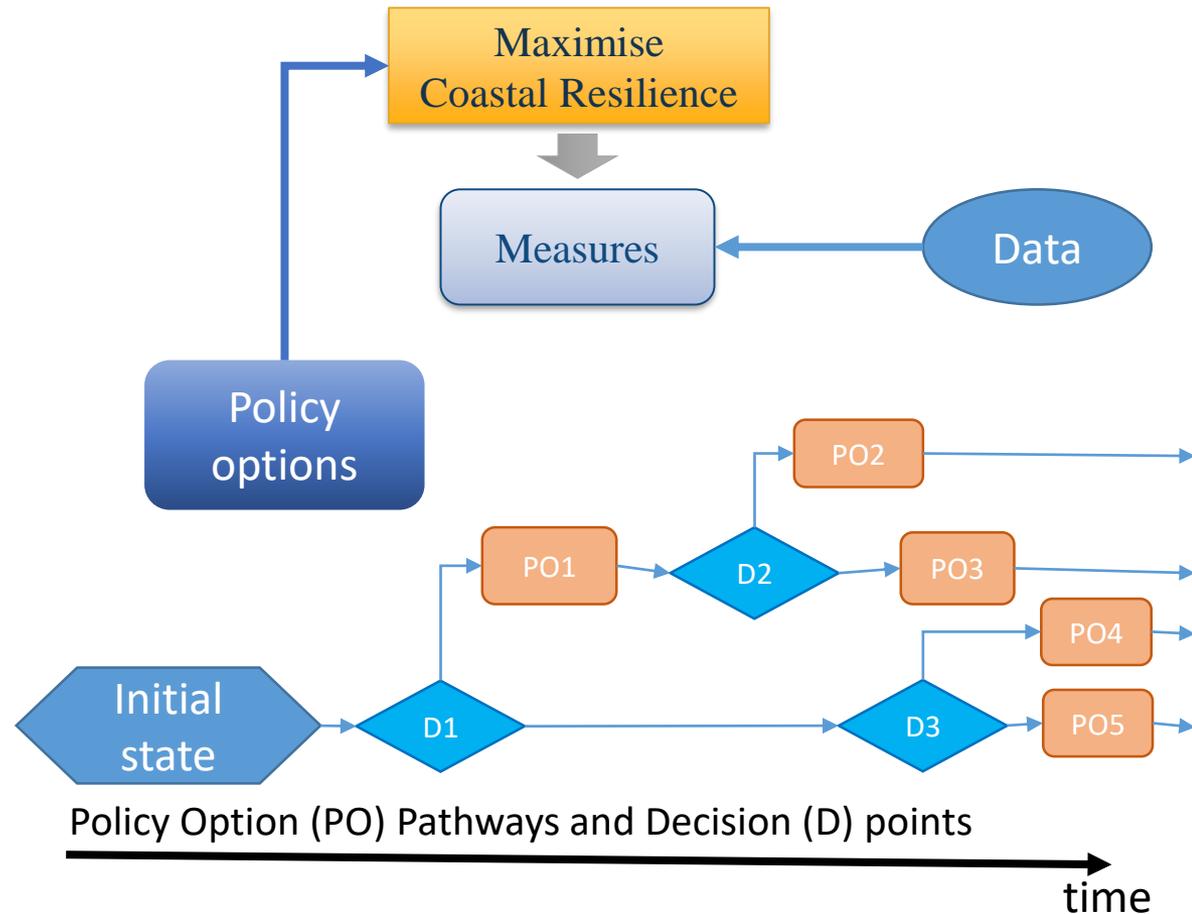
Overview of the Conceptual Framework

What is the objective?

How do we assess state?

What actions can improve coastal resilience?

What does this involve?



Proposed Coastal Resilience Objectives

To deliver enhanced coastal resilience there is a need to:

- Minimise injury, loss of life and health impacts;
- Minimise damage to property and infrastructure;
- Minimise residual risk and community recovery time;
- Minimise local economic disruption;
- Minimise habitat loss and disruption of natural coastal system;
- Maximise community preparedness for events.
- With appropriate governance arrangements that improve social justice

Making the residual risk explicit will promote awareness and help communities to prepare



Maximising Coastal Resilience

- Minimise injury, loss of life and health impacts
(People/Social Capital);
- Minimise damage to property and infrastructure
(Property/Physical Capital);
- Minimise residual risk and community recovery time
(Property/Physical Capital);
- Minimise local economic disruption
(Property/Physical Capital) ;
- Minimise habitat loss and disruption of natural coastal system
(Nature/Natural Capital);
- Maximise community preparedness for events
(People/Social Capital).



Maximising Coastal Resilience

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(Nature/Natural Capital);
- Maximise community preparedness for events
(People/Social Capital).

MINIMISE LOSS



Maximising Coastal Resilience

- Minimise injury, loss of life and health impacts
(People/Social Capital);
- Minimise damage to property and infrastructure
(Property/Physical Capital);
- Minimise residual risk and community recovery time
(Property/Physical Capital);
- Minimise local economic disruption
(Property/Physical Capital) ;
- Minimise habitat loss and disruption of natural coastal system
(Nature/Natural Capital);
- Maximise community preparedness for events
(People/Social Capital).

MINIMISE DAMAGE (COSTS)



Maximising Coastal Resilience

- Minimise injury, loss of life and health impacts
(People/Social Capital);
- Minimise damage to property and infrastructure
(Property/Physical Capital);
- Minimise residual risk and community recovery time
(Property/Physical Capital);
- Minimise local economic disruption
(Property/Physical Capital) ;
- Minimise habitat loss and disruption of natural coastal system
(Nature/Natural Capital);
- Maximise community preparedness for events
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MINIMISE RISK AND RECOVERY TIME



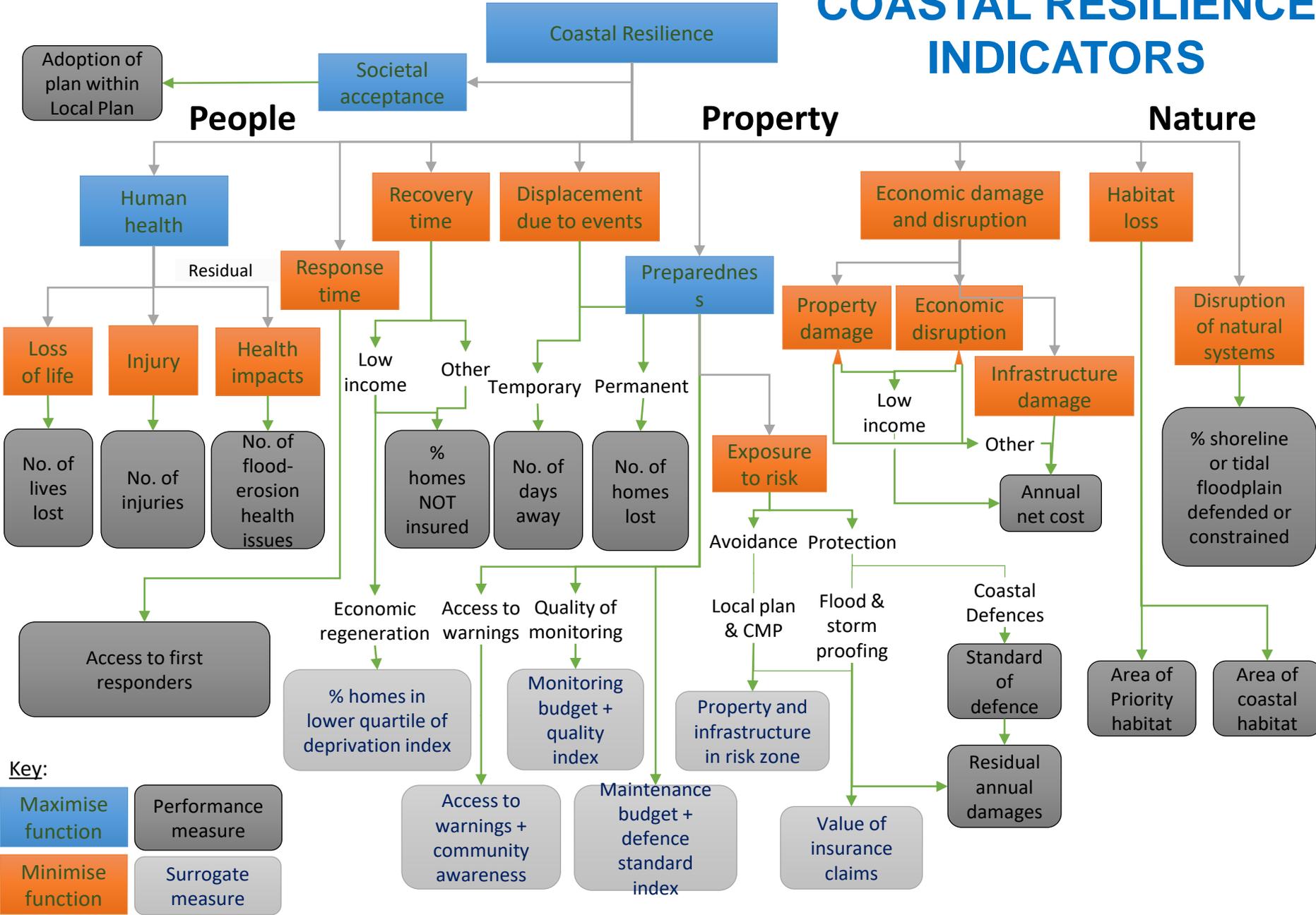
Maximising Coastal Resilience

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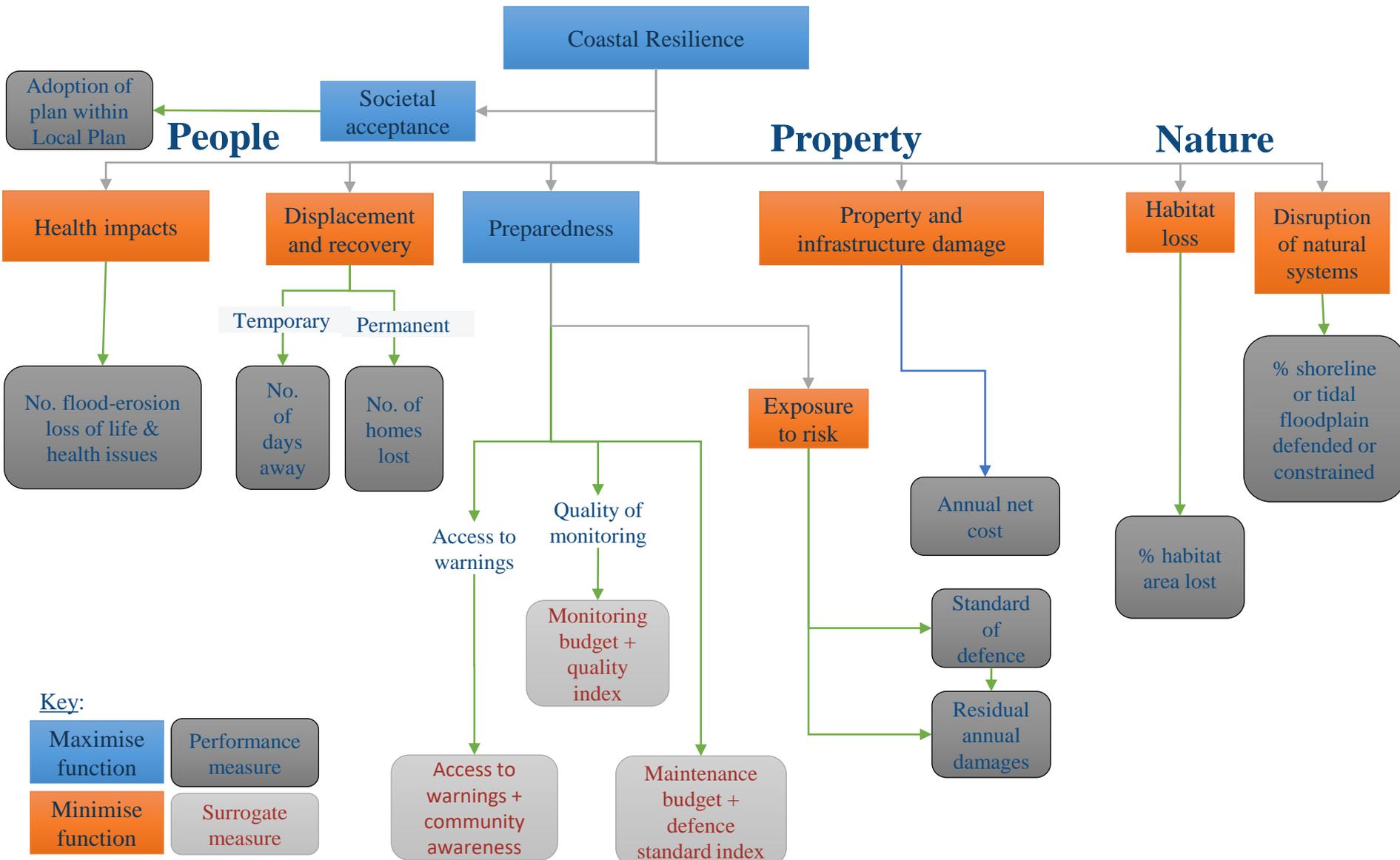
MAXIMISE PREPAREDNESS



COASTAL RESILIENCE INDICATORS



SIMPLIFIED SET OF COASTAL RESILIENCE INDICATORS



Enhanced resilience delivered through Policy Options

Defra Adaptation Options

- Prevent loss
- Tolerate loss
- Spread or share loss
- Change use or activity
- Change location
- Restore and replace

EA Resilience Tools



High level and generic

Mix of specific and vague



Tools used to achieve place based resilience standards



Flood walls



Coastal infrastructure



Natural flood management



Property flood resilience



Flood warnings



Sustainable drainage systems



Evacuation



Recovery



Land management



Spatial planning



Innovation

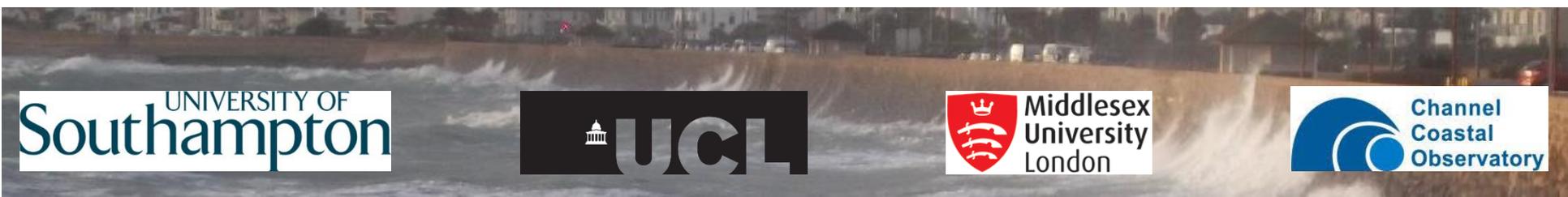


Moving people to new places

Proposed Policy Options

Blue – location specific
 Green – applicable everywhere
 Pink – location specific options

Defra Options CoastalRes Policy Options	Prevent Loss	Tolerate Loss	Spread Loss	Change Use	Change Location	Restore Replace
Land use planning				Green	Pink	
Catchment management planning	Pink			Green		
Coast protection	Blue					
Flood and storm proofing	Blue	Blue				
Emergency planning & response	Green	Green				
Storm warning and monitoring	Green	Green				
Restoration and recovery			Green			Green
Managed realignment				Blue	Blue	
Socio-economic regeneration				Blue		Blue



Coastal Governance Implications



Coastal Governance: Where are we now?

How does the CoastRes method compare with existing SMPs in delivering coastal resilience

- SMPs sit within DEFRA (one govt dept)
- SMPs are more deliverable within the current govt structure.
- DEFRA is committed to this area
- SMPs offer the ability to deliver on flood and erosion management, but not to build resilience.

To deliver resilience we need a more holistic approach.



Governance implications of the CoastRes approach

What are the implications of our approach?

- Requires nine policy options
 - Already exist, but they are currently independent
 - To deliver coastal resilience they need to work together
- Requires a transformation to coastal governance
 - Ministerial and departmental transformation
 - A cross-departmental approach (like climate change and Brexit)
 - A ‘coastal change committee’ (like the ‘climate change committee’) to provide higher level oversight (maybe)



The results of this method is presented in Session 3.

Here we consider our approach and especially the Policy Options



Breakout groups



Breakout groups:

What are the implications of managing the coast using these policy options for resilience?

- All groups (25 mins)
 - Suggested discussion points are below
 - Rapporteurs will agree key points at end
1. Is the CoastRes Resilience Framing useful and practical?
 2. What do the participants think of the individual Policy Options – what do they like and what might be missing?
 3. Thinking more generally, what steps are needed to facilitate a move to a resilience approach happen to address coastal flooding and erosion?



What are the implications of managing the coast using these policy options for resilience?

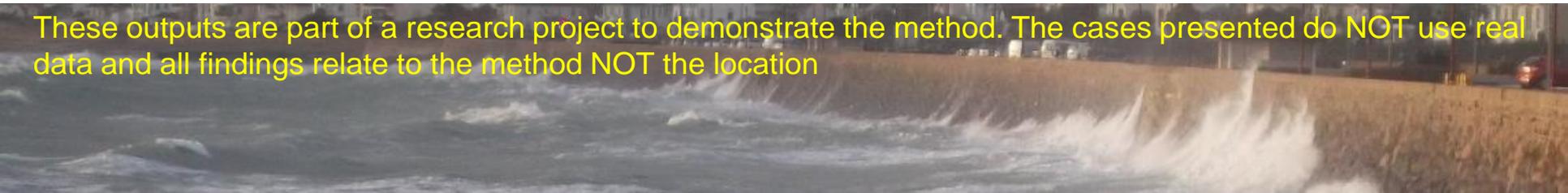
CoastalRes Policy Options	
Land use planning	Catchment management planning
Coast protection	Flood and storm proofing
Emergency planning & response	Storm warning and monitoring
Restoration and recovery	Managed realignment
Socio-economic regeneration	

1. Is the CoastalRes Resilience Framing useful and practical?
2. What do the participants think of the individual Policy Options – what do they like and what might be missing?
3. Thinking more generally, what steps are needed to facilitate a move to a resilience approach happen to address coastal flooding and erosion?

Session 3: A new method to characterise coastal resilience

Chair: Robert Nicholls. Presentations: Ian Townend and Edmund Penning-Rowsell

These outputs are part of a research project to demonstrate the method. The cases presented do NOT use real data and all findings relate to the method NOT the location



Multi-Criteria Analysis (MCA)

- Well established
- Used across government
- Used for projects and strategic assessments
- e.g. DCLG, EA, Treasury

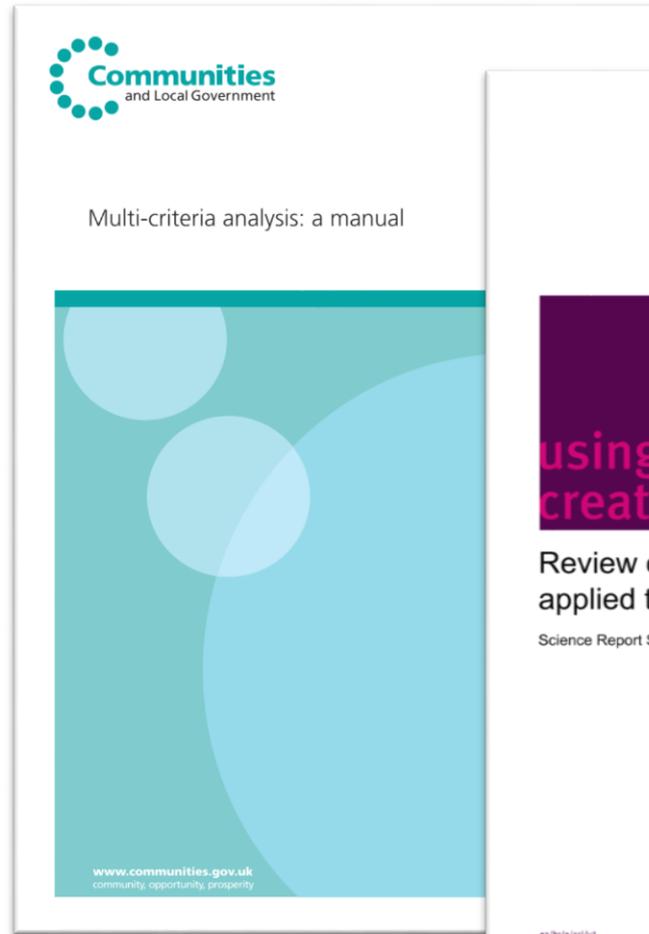
UK National Ecosystem Assessment

UK Biodiversity Action Plan

UK Sustainable Forest Management

UK Marine Environment

UK Renewable Energy Planning



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“Which” magazine performance matrix

Table 4.1 Performance matrix

Options	Price	Reheat setting	Warming rack	Adjustable slot width	Evenness of toasting	Number of drawbacks
Boots 2-slice	£18				☆	3
Kenwood TT350	£27	✓	✓	✓	☆	3
Marks & Spencer 2235	£25	✓	✓		★	3
Morphy Richards Coolstyle	£22				☆	2
Philips HD4807	£22	✓			★	2
Kenwood TT825	£30				☆	2
Tefal Thick'n'Thin 8780	£20	✓		✓	★	5

A tick indicates the presence of a feature. Evenness of toasting is shown in *Which?* on a five-point scale, with a solid star representing the best toaster, and an open star the next best. The family eliminated from consideration all the toasters that scored less than best or next best.

Source: DCLG, 2009, Multi-criteria analysis: a manual

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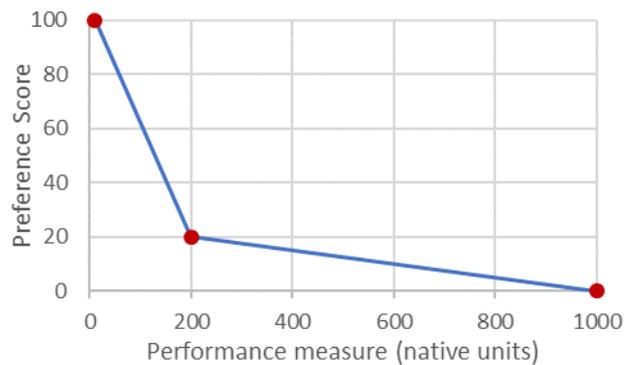
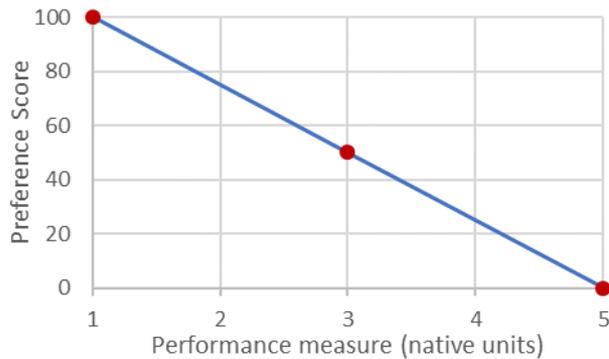
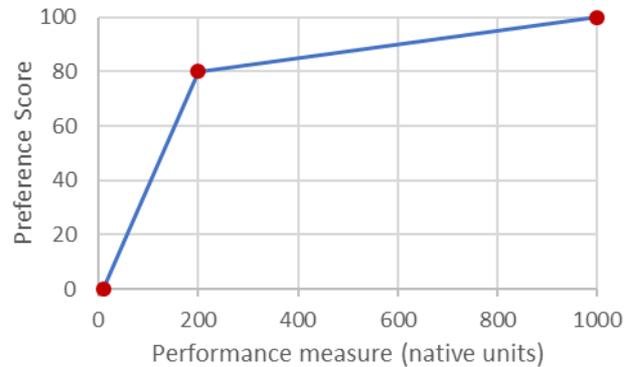
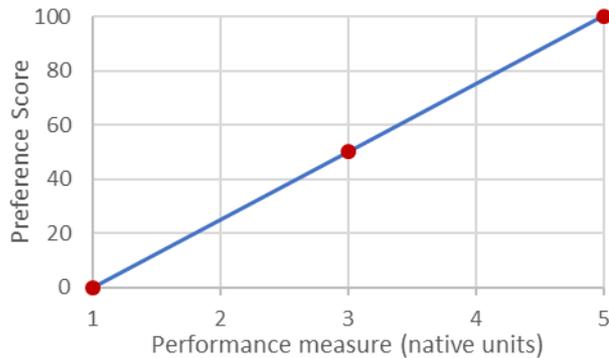
MCA process

- Establish the aim (decision making context)
- Identify what is to be achieved – the objectives
- Define measures to assess how well objectives are fulfilled
- Assess the expected performance of each measure for:
 - Projected futures > Scenarios
 - Actions to better achieve the objectives > Policy Options
- Scoring to assess collective impact of all performance measures
- Weighting of measures to reflect their relative importance
 - Reflects decision makers preferences (utility theory)

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Scoring

Map each measure to a common scale: 0-100



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Weighting

- Weight the measures to reflect their relative importance
 - A form of ranking
 - Depends on decision maker preferences
- Various formal methods available to obtain stakeholder preferences, e.g.
 - Analytic Hierarchy Process (AHP), Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH), Outranking methods such as ELECTRE.
- Envisage weights being used for national policy evaluation
 - use sectoral views to assess impact of different preferences
 - e.g. Economic, Social, Environmental

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Combine Scores and Weighting

- Scores map the measures to a common scale
- Weights reflect decision makers preferences

Source: DCLG, 2009, Multi-criteria analysis: a manual

Table 6.4 Calculating overall scores

Options	Price	Reheat setting	Warming rack	Adjustable slot width	Evenness of toasting	Drawbacks	Total
Boots 2-slice	100	0	0	0	0	50	35
Kenwood TT350	25	100	100	100	0	80	61
Marks & Spencer 2235	42	100	100	0	100	50	53
Morphy Richards Coolstyle	67	0	0	0	0	100	30
Philips HD4807	67	100	0	0	100	90	49
Kenwood TT825	0	0	0	0	0	90	9
Tefal Thick'n'Thin 8780	84	100	0	100	100	0	70
Weights	30	5	15	25	15	10	

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Scenarios

- Scenarios represent projections of different futures
- Project how measures are likely to change due to:
 - Climate change (e.g. sea level rise, rates of erosion)
 - Demographics and migration (e.g. population, house building)
 - National policies (e.g. market v directed economy)

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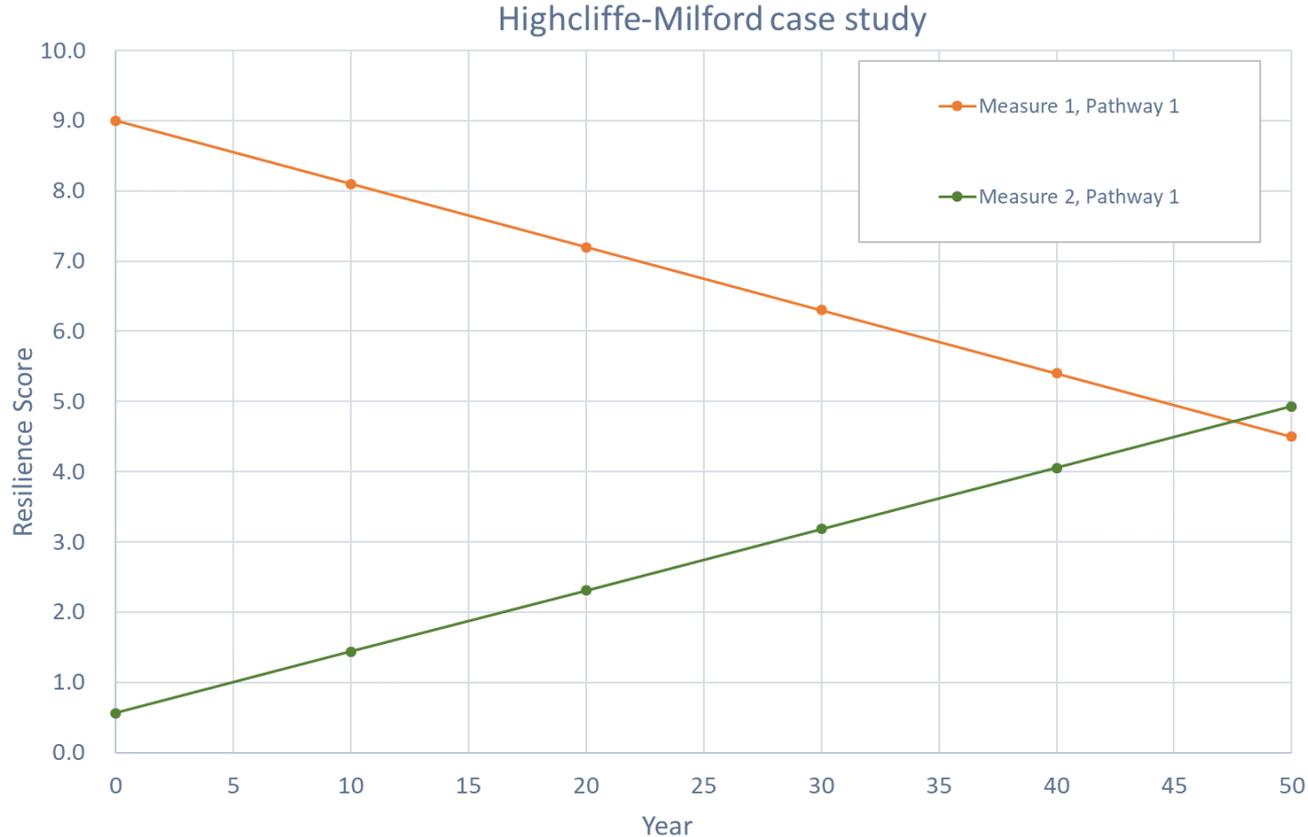
Policy Option Sets or Pathways

- Collection of policy options
- Can vary over time in response to events or triggers
- Aimed at maximising resilience over time
- Subject to financial affordability

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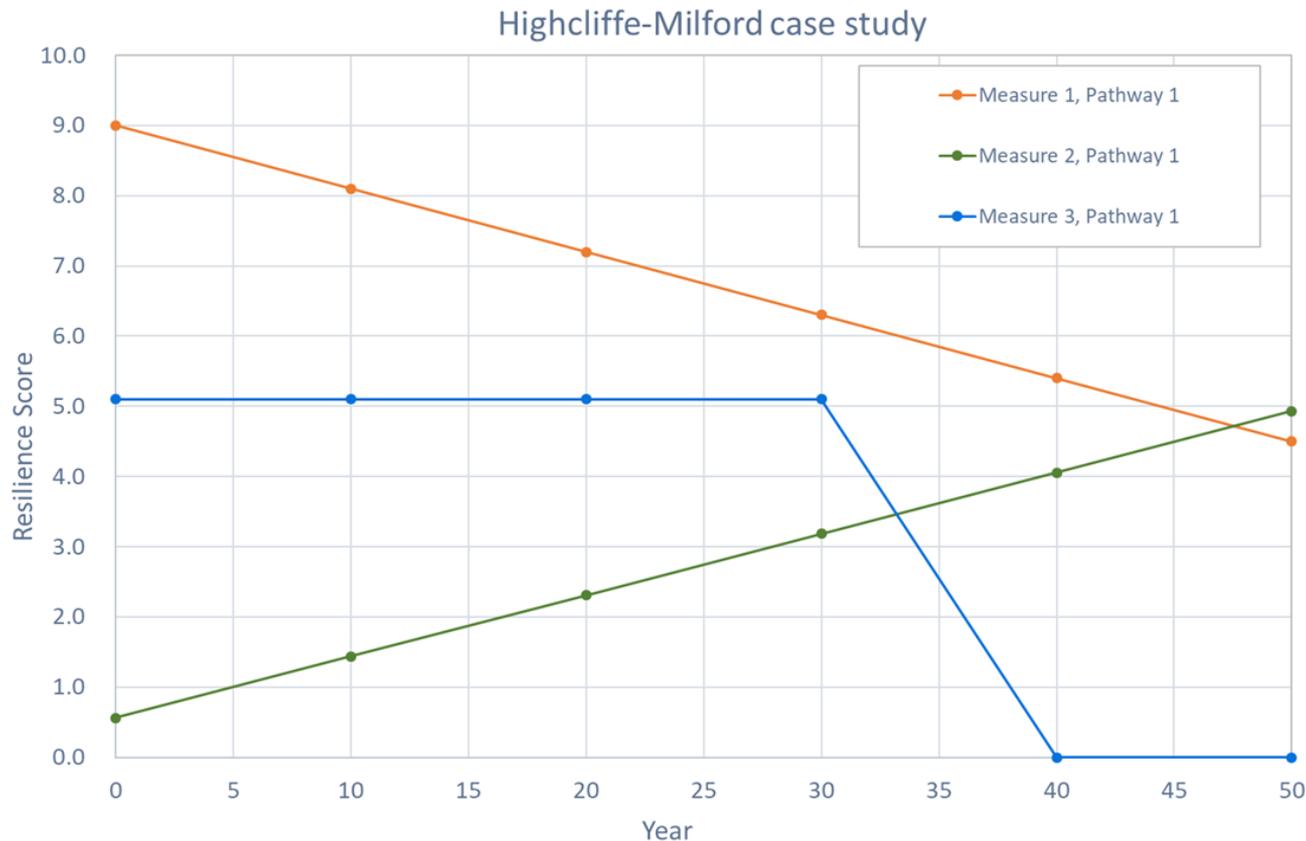
Measures can vary over time depending on:

Policy implementation and environmental change



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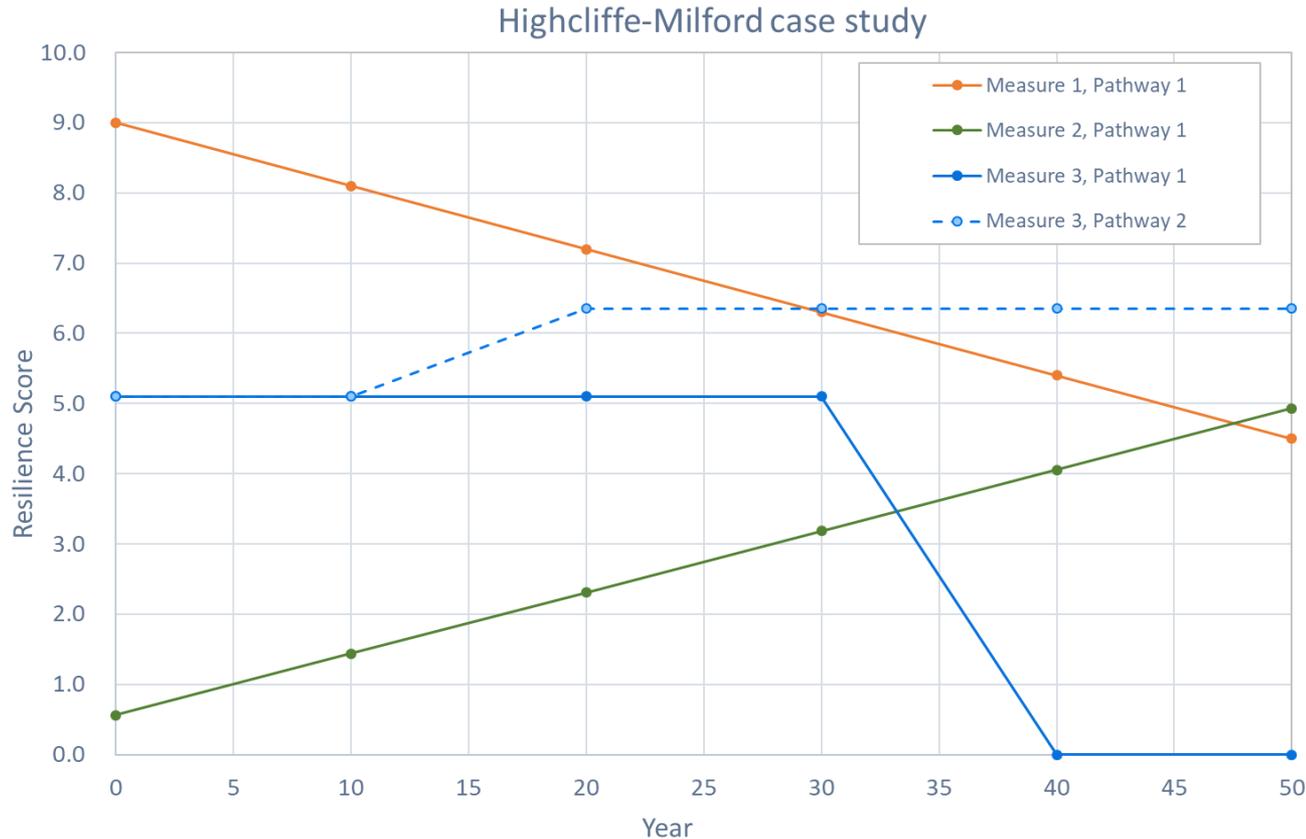
Measures can vary over time depending on: Policy implementation and environmental change



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Measures can vary over time depending on:

Policy implementation and environmental change



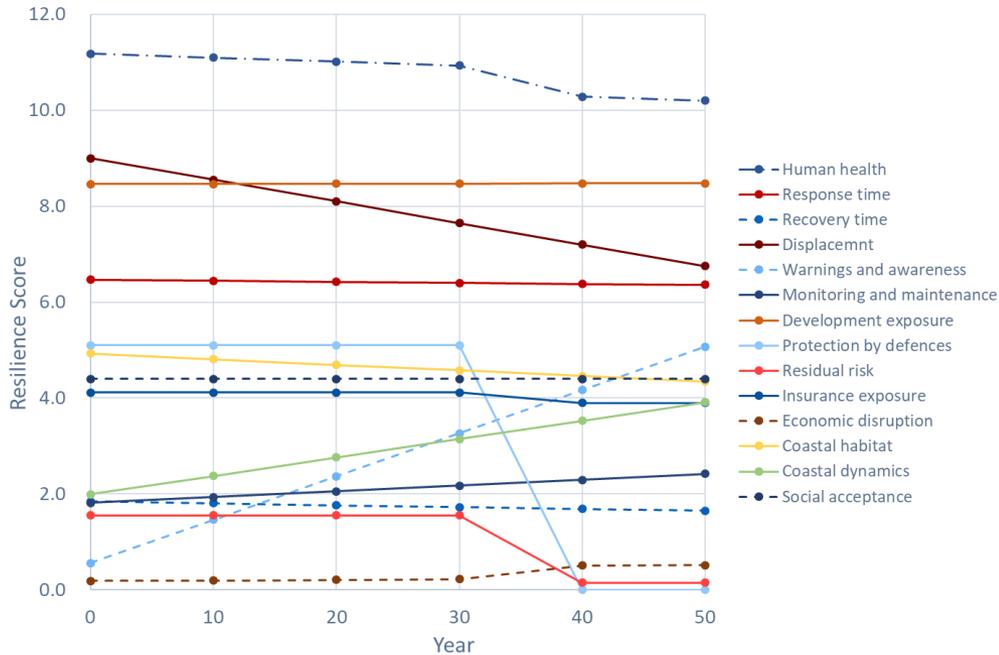
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Measures can vary over time

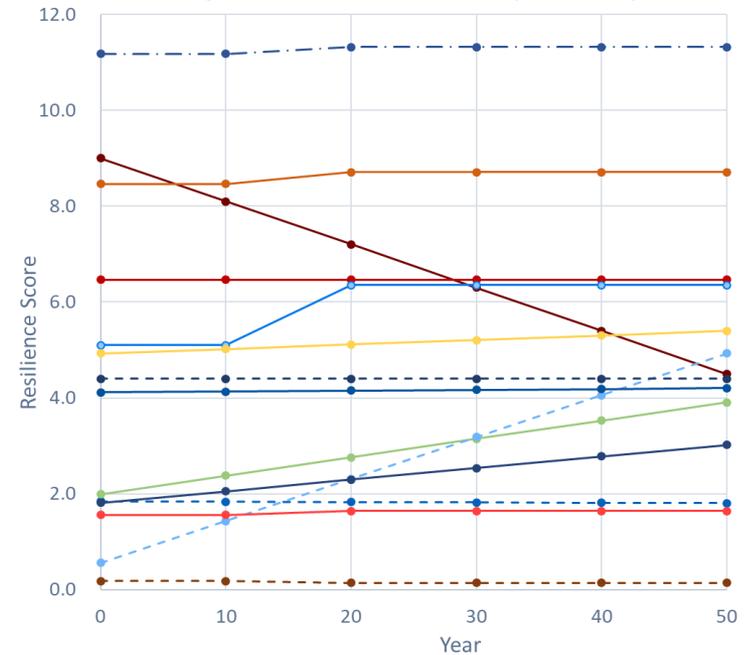
depending on:

Policy implementation and environmental change

Highcliffe-Milford case study, Pathway 1

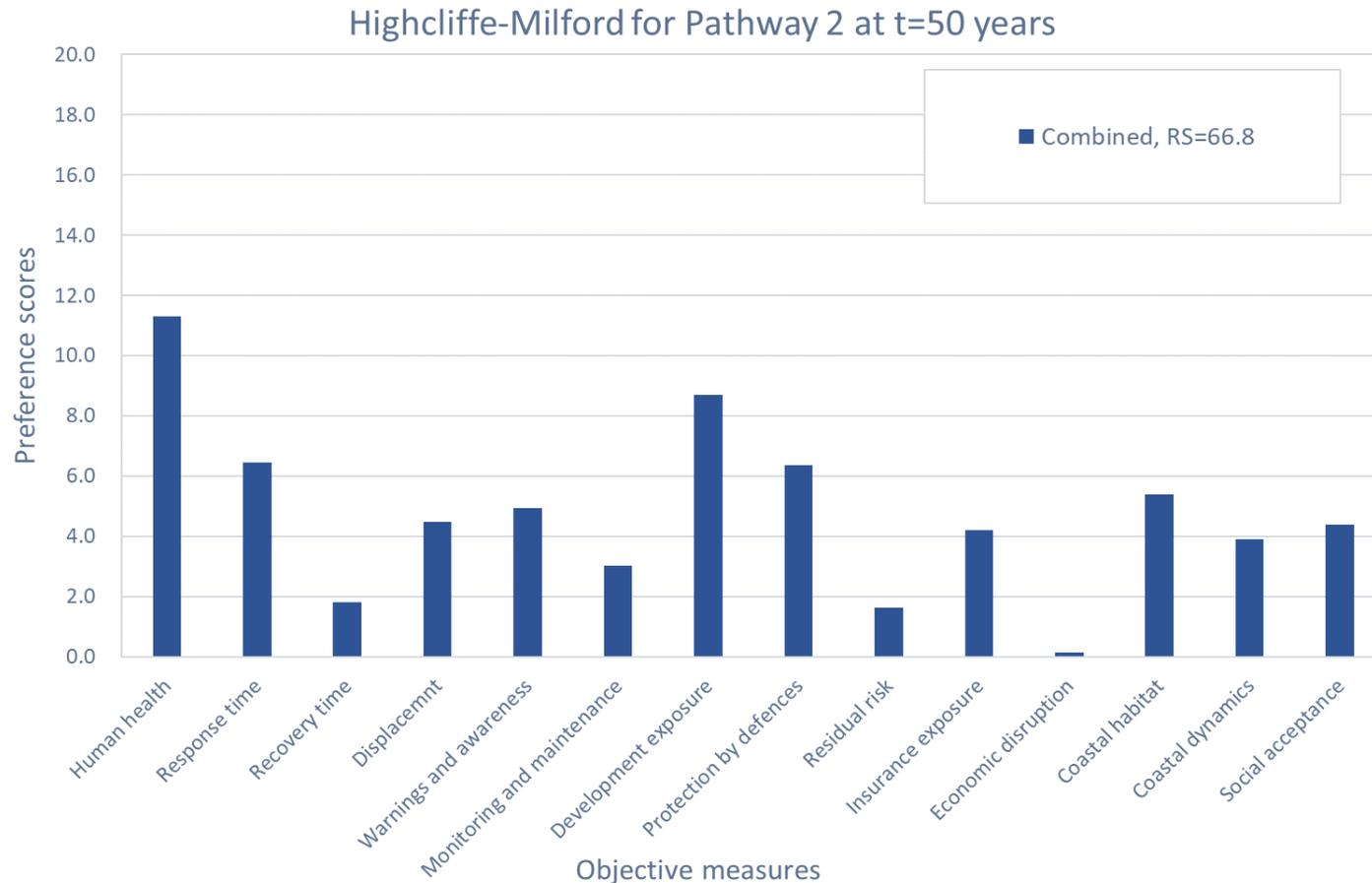


Highcliffe-Milford case study, Pathway 2



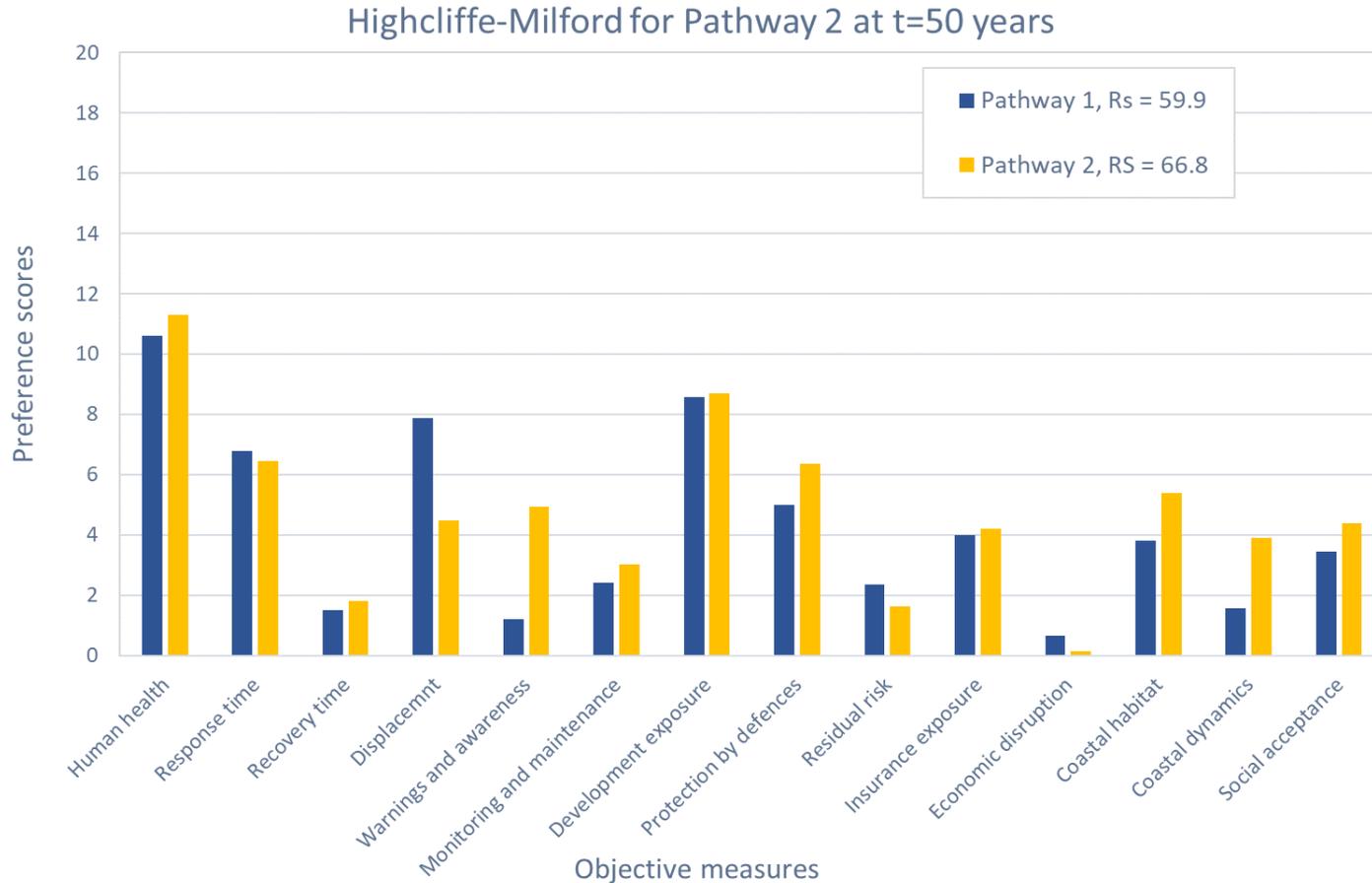
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Measures give a signature at a point in time



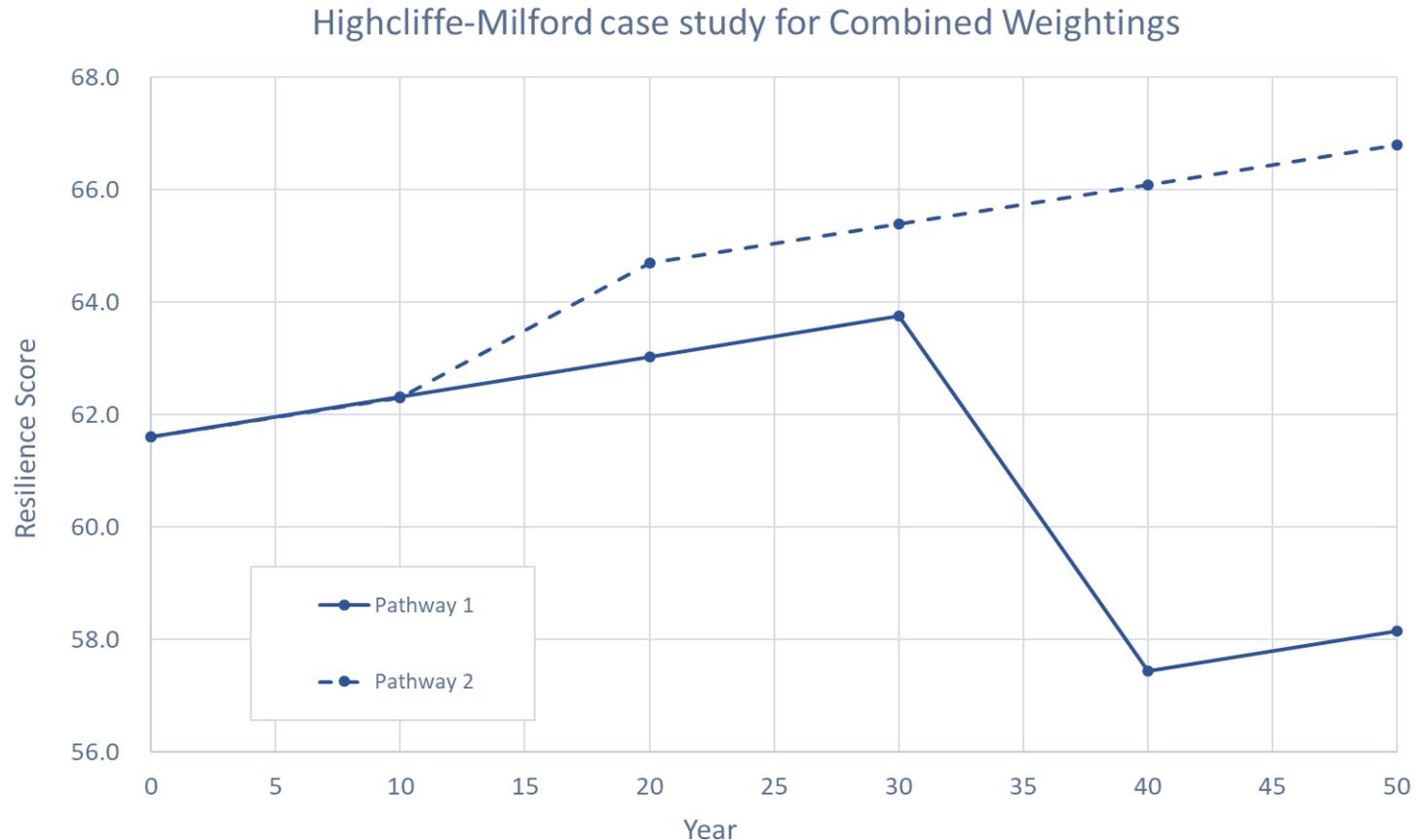
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Allowing Pathways to be compared



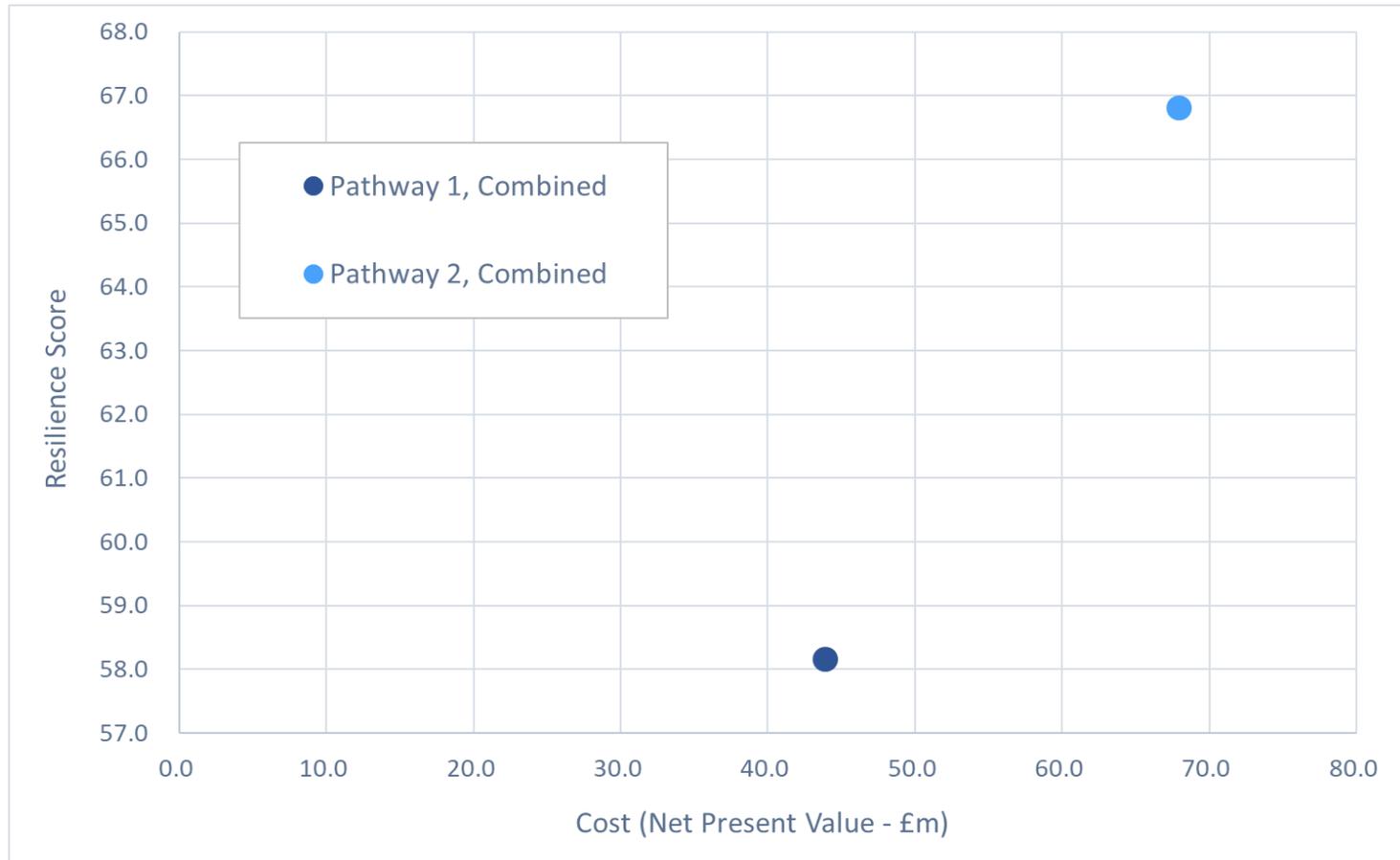
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Total Resilience Score for each Pathway



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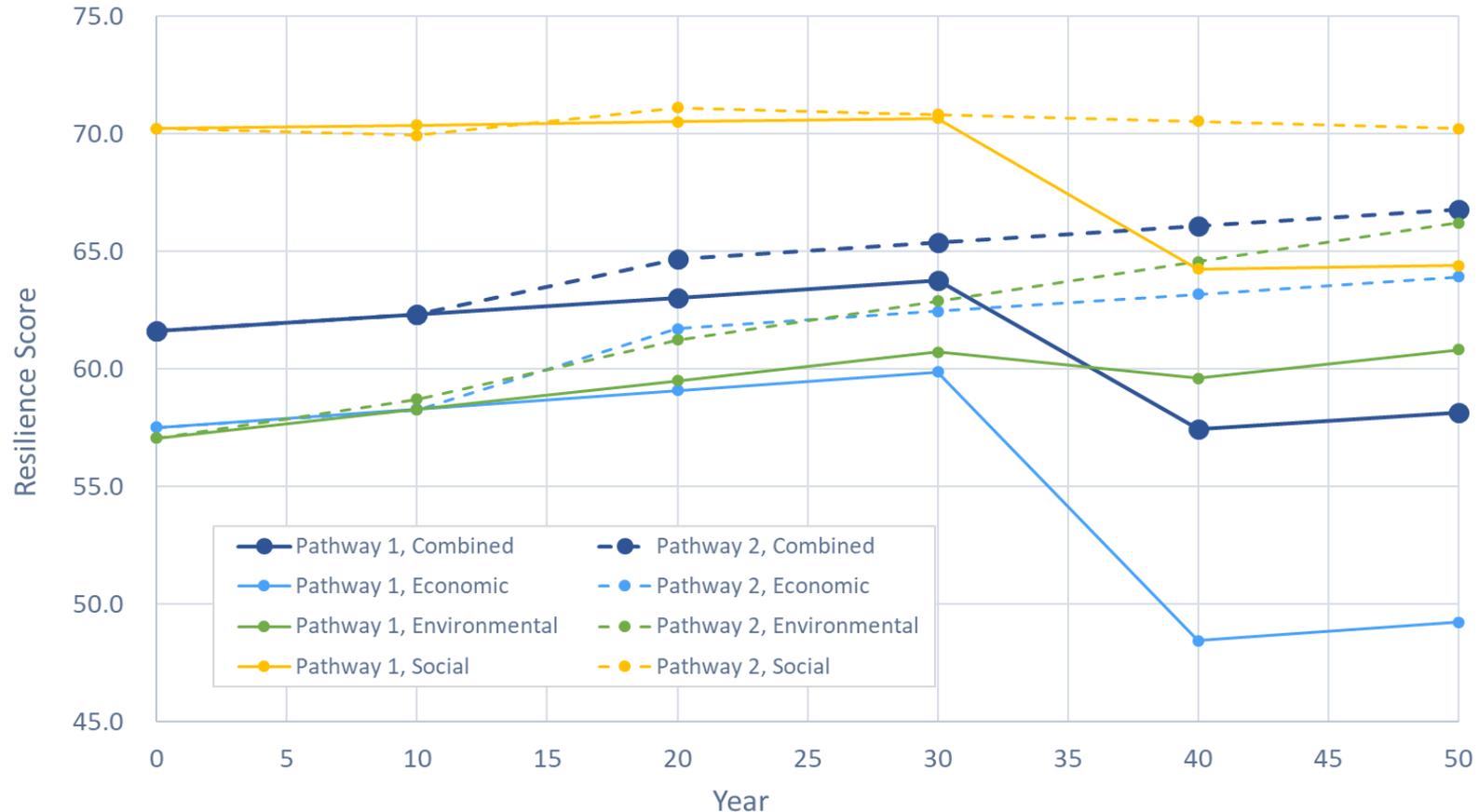
Evaluate Cost of different Policy Pathways



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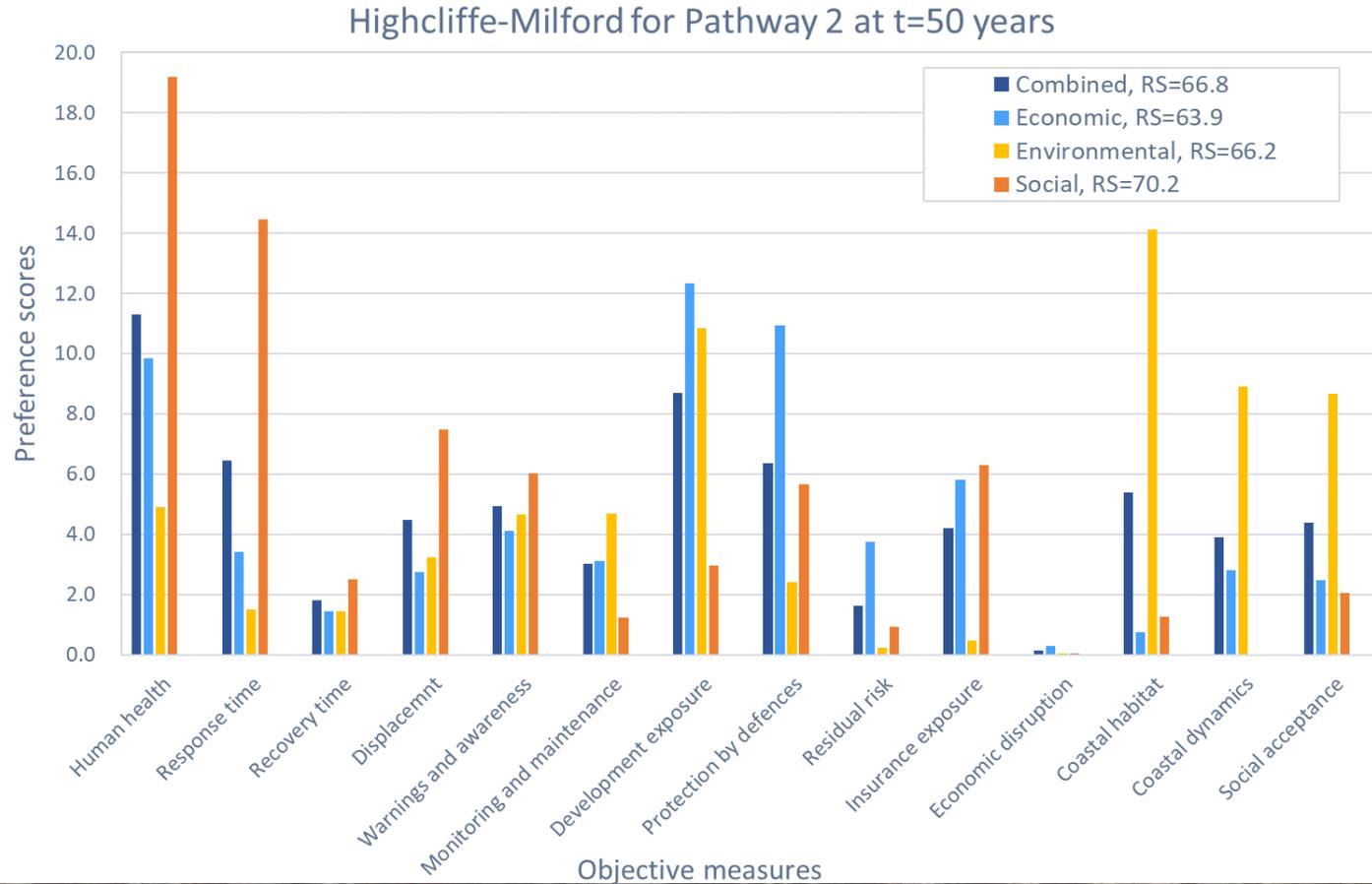
Influence of Weightings

Highcliffe-Milford case study for different weightings



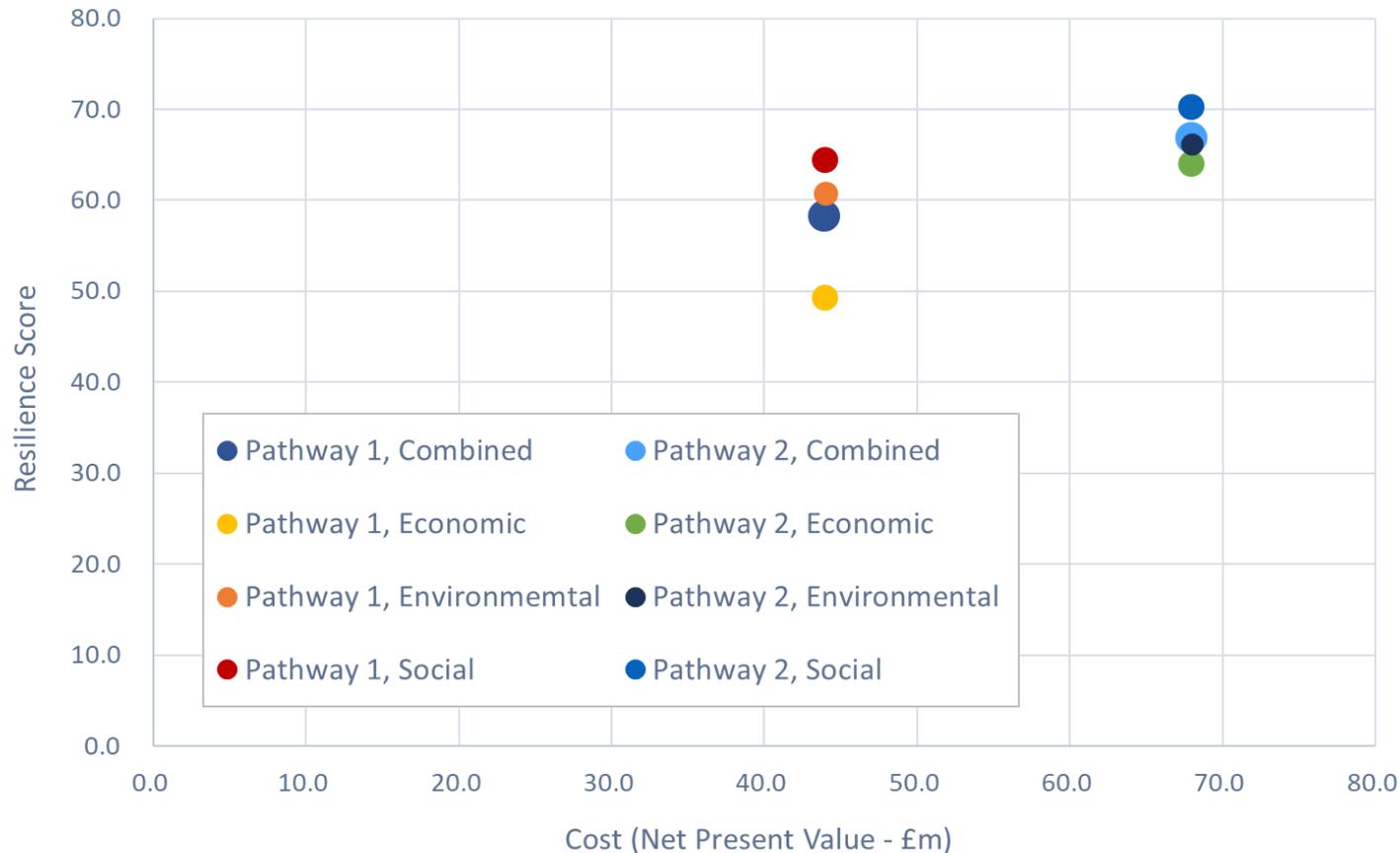
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Influence of weightings on resilience signature



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Cost-Resilience for different weightings



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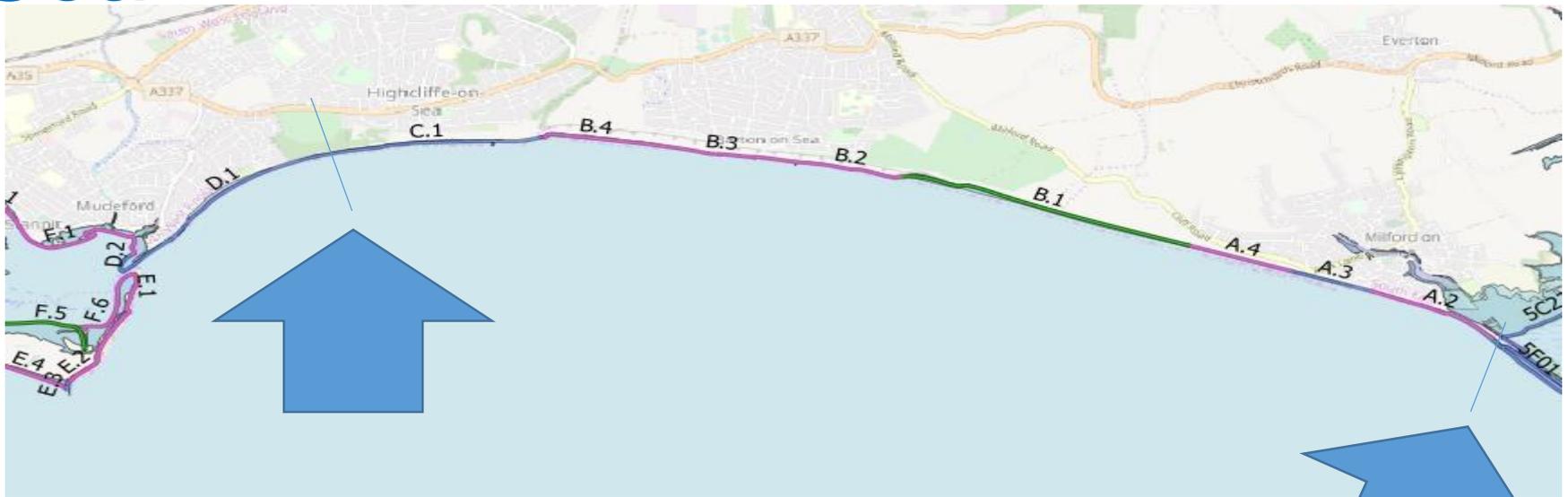
Three Illustrative Studies

- Case 1 –based on Highcliffe-Milford
 - Eroding cliff coast, with partial defence protection
- Case 2 – based on Outer Humber (north bank)
 - Low-lying, rural estuarine coast, with flood embankments
- Case 3 – based on Portsmouth
 - Urban coast with recently upgraded defences

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Case 1 Highcliffe- on-Sea to Milford on Sea

- Management Units: C1, B1-4, A2-4
- Major longer term transition potential – Hengistbury Head
- New Milton – high longer-term property at risk from erosional loss
- Predominantly erosional risk
- Low deprivation
- Coastal length 10.47 km
- Archetypes: Urban open coast, Rural open coast,



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Key points from illustrative study 1

Pathway 1

- No new defences and current defences fail after 30 years
- Hazard zone encroaches on area of denser housing

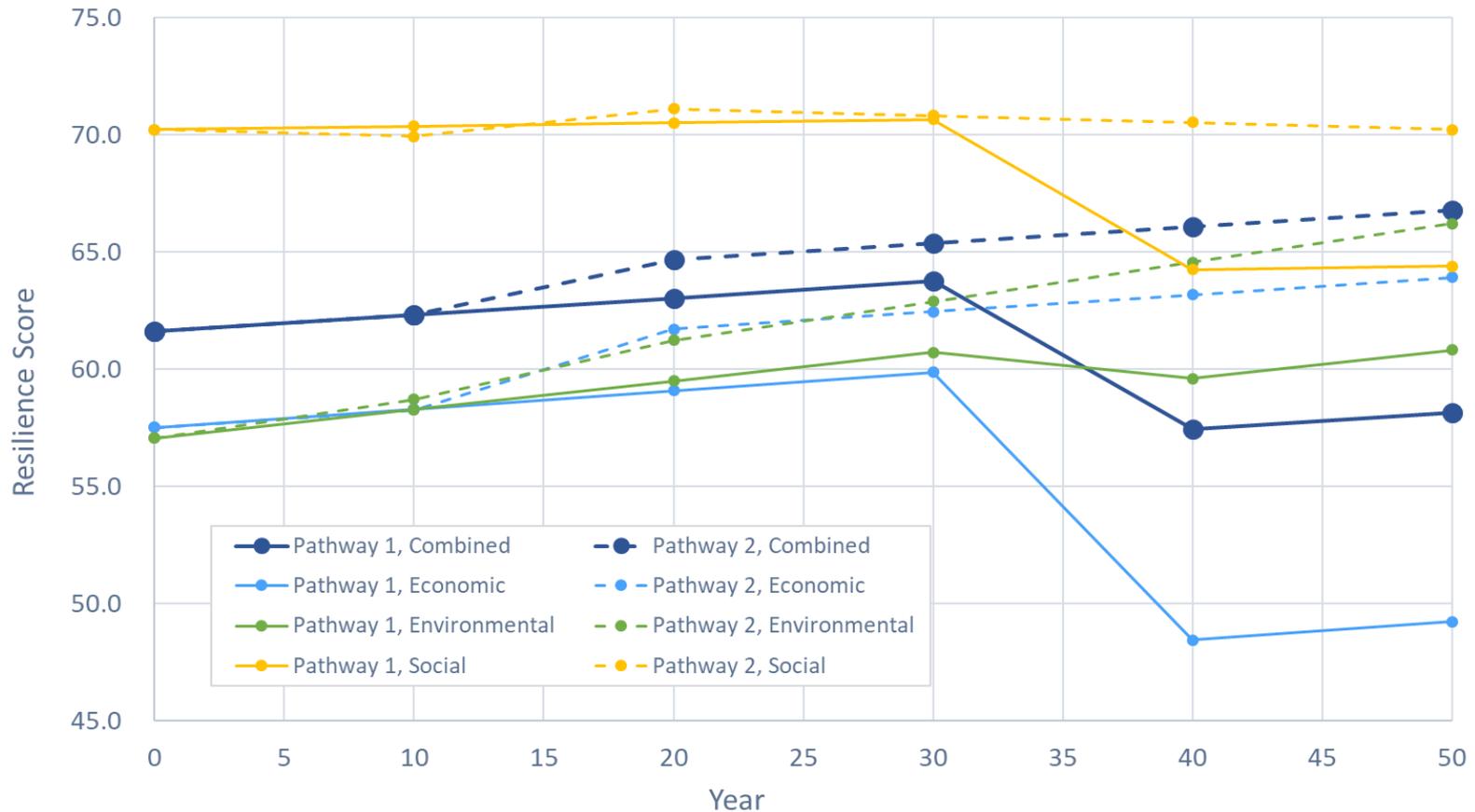
Pathway 2

- Relocate the worst affected properties
- Allow cliff to retreat to create more coastal space
- In 15-20 years upgrade defences on a retreated line

Illustrates the benefit of well timed defence provision alongside other measures to enable those affected to adapt and increase community awareness

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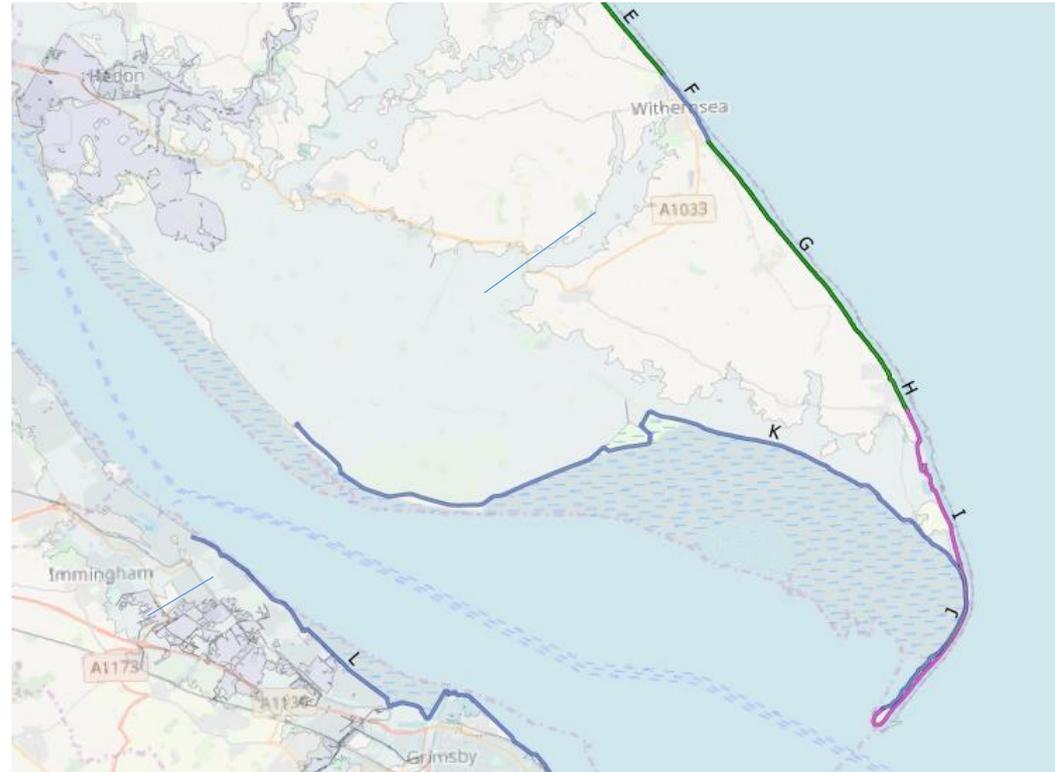
Illustrative study 1



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Case 2. Outer Humber Estuary

- Management Units F, G, H, I, J, K
- Outer Humber – overlaps with Estuary Management Plan (Jacobs)
- Predominantly flood risk,
- Spurn Head erosional system with potential system transitions
- Small-scale set-backs already undertaken and planned flood storage
- Archetypes: Rural Estuary



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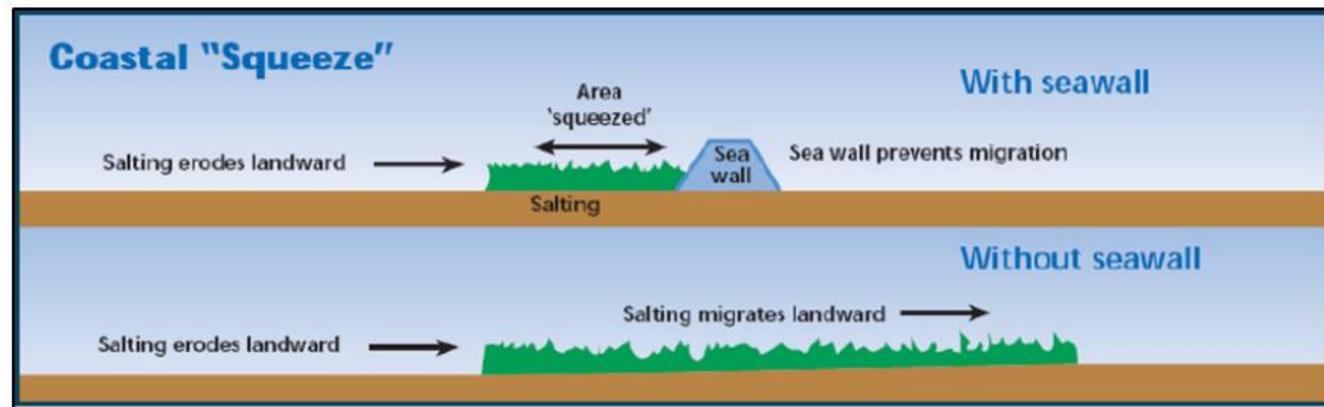
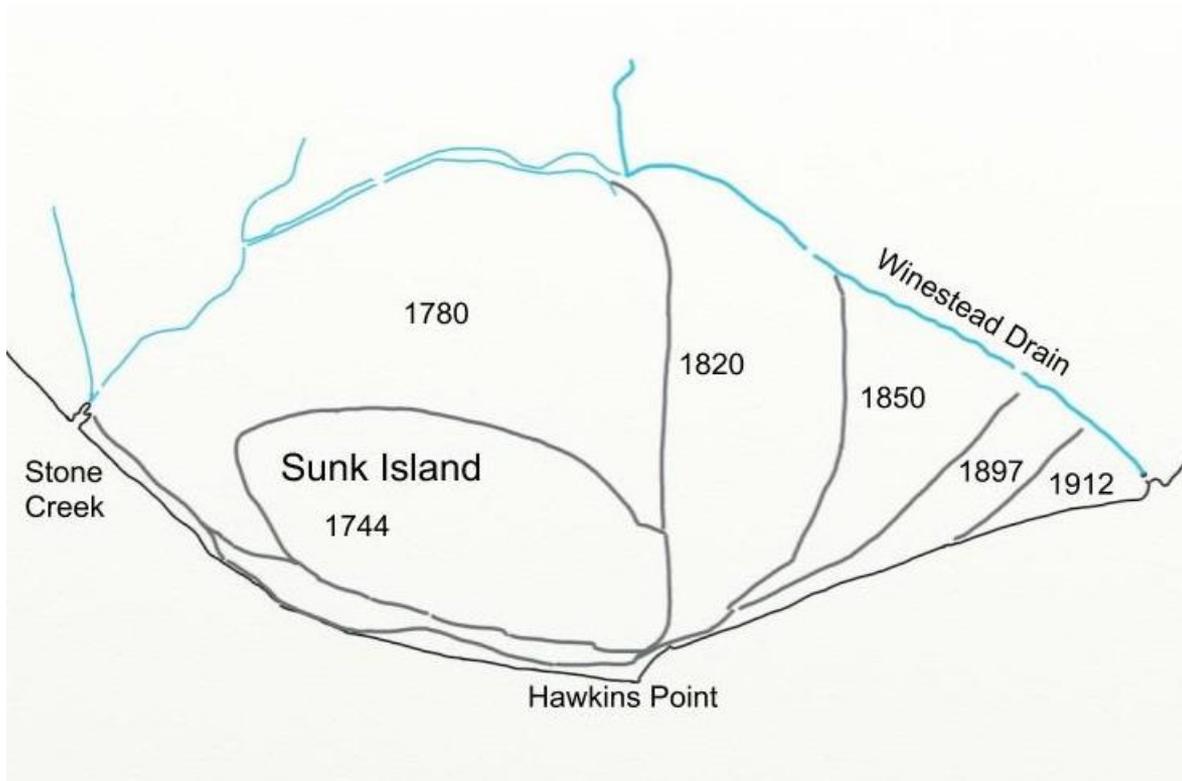
SUNK ISLAND ESTATE

Winestead Pumping Station to Stone Creek

The path along the top of the bank is not a public right of way but a courtesy path. The Commissioners may close the path without notice and in particular this will be necessary from time to time for bank maintenance.

There are no intermediate access points from Sunk Island. No access from Outstray Farm

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Key points from illustrative study 2

Pathway 1

- Extensive managed realignment to offset coastal squeeze
- Defences reduced and intertidal habitat increased

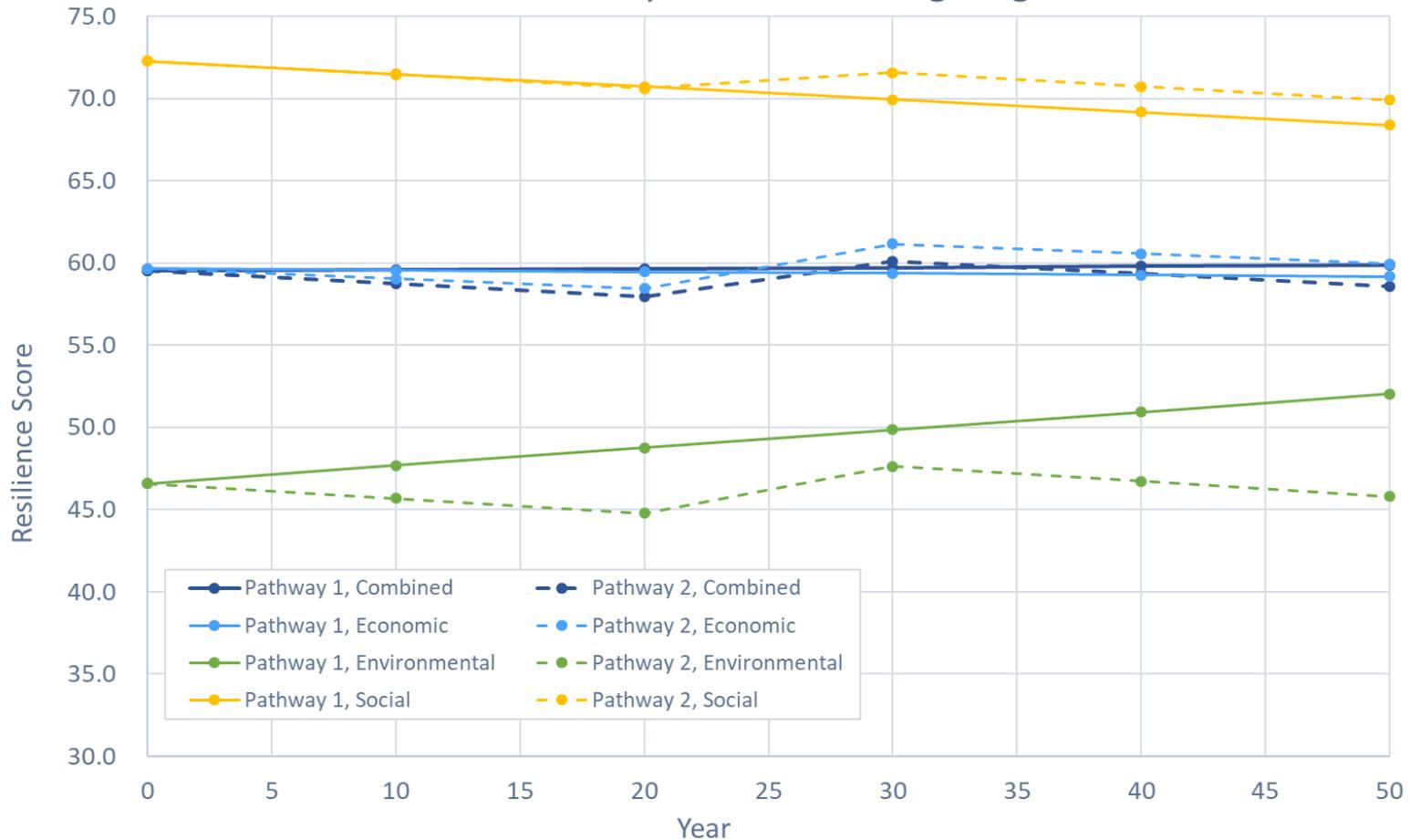
Pathway 2

- Pathway 1 is disrupted after 20 years by a change in government priorities
- Land reclaimed and defended to maximise agricultural production

Impact on resilience score only really clear for the environmental weightings

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Illustrative study 2

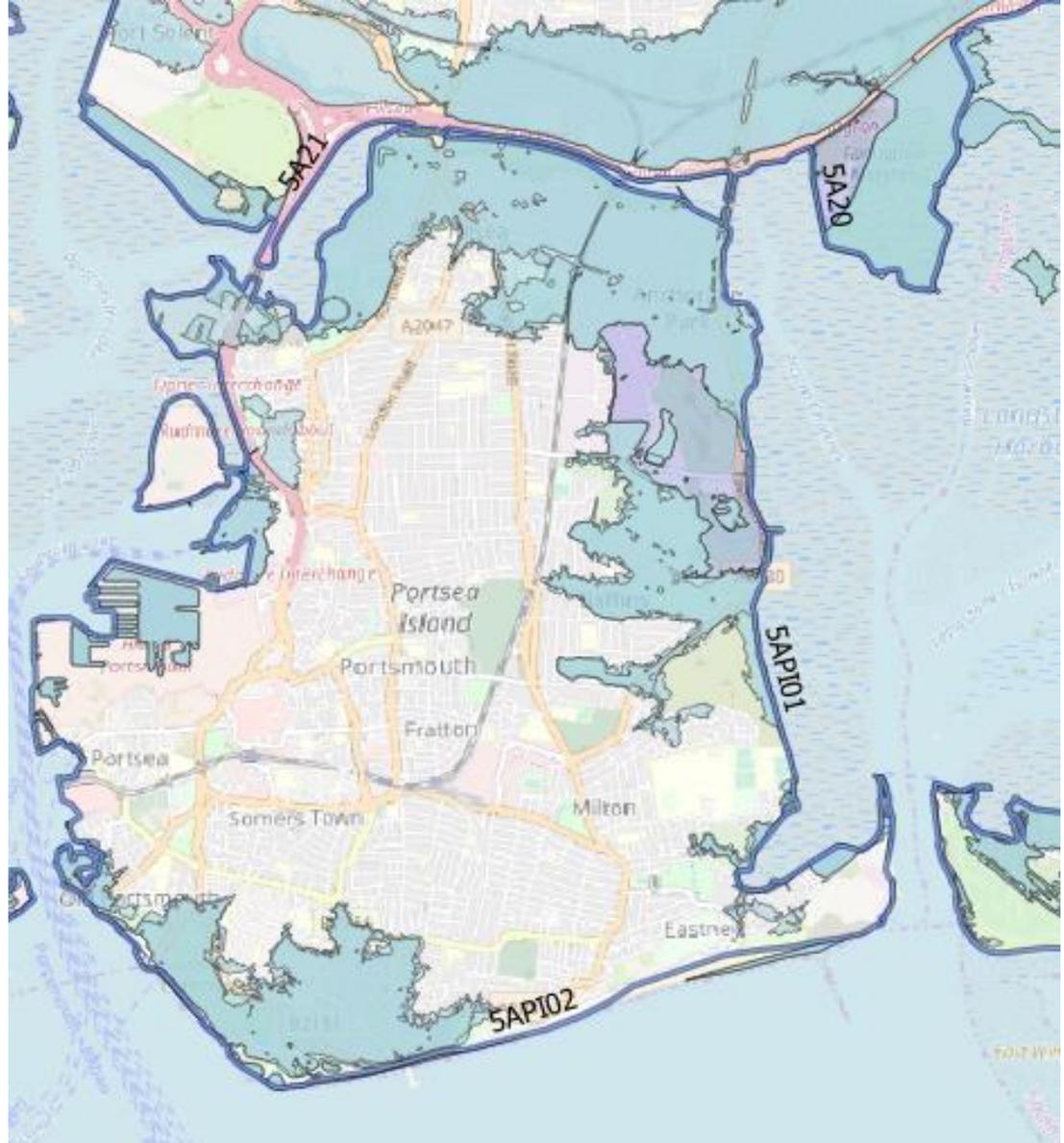


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Case 3

Portsmouth

- 2 Management Units
5API01 – 5API02
- Estuary / Harbour and Open Coast both HTL
- Residual risk is rising to 2100
- Predominantly flood risk
- High to Low Deprivation
- Coastal length 29.85 km
- Archetypes: Urban Estuary and Urban Open Coast



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24 Eastern Villas Rd

Portsmouth, England

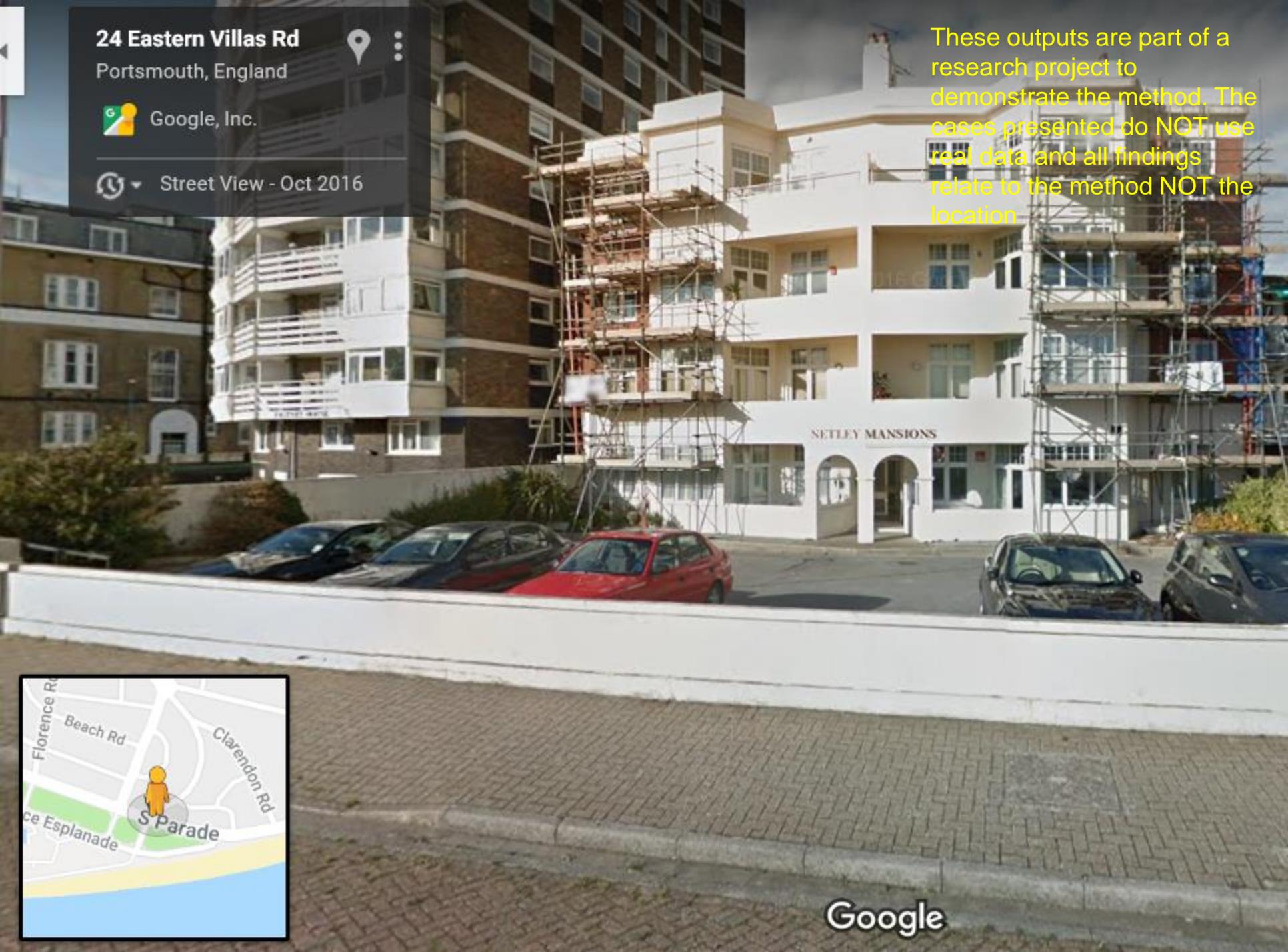


Google, Inc.



Street View - Oct 2016

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Google

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19 Everdon Ln

Portsmouth, England

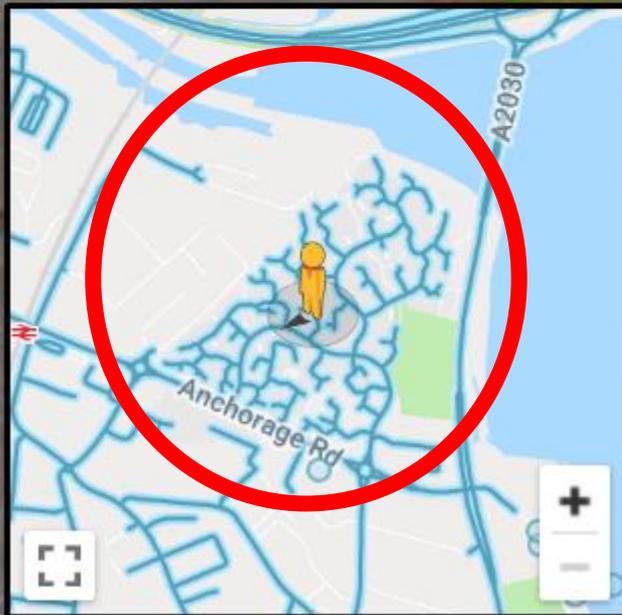


Google, Inc.



Street View - May 2012

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Go



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Google

Key points from illustrative study 3

Pathway 1

- Defence recently upgraded to high standard
- High asset value means that residual risk remains significant and increases as a result of climate change

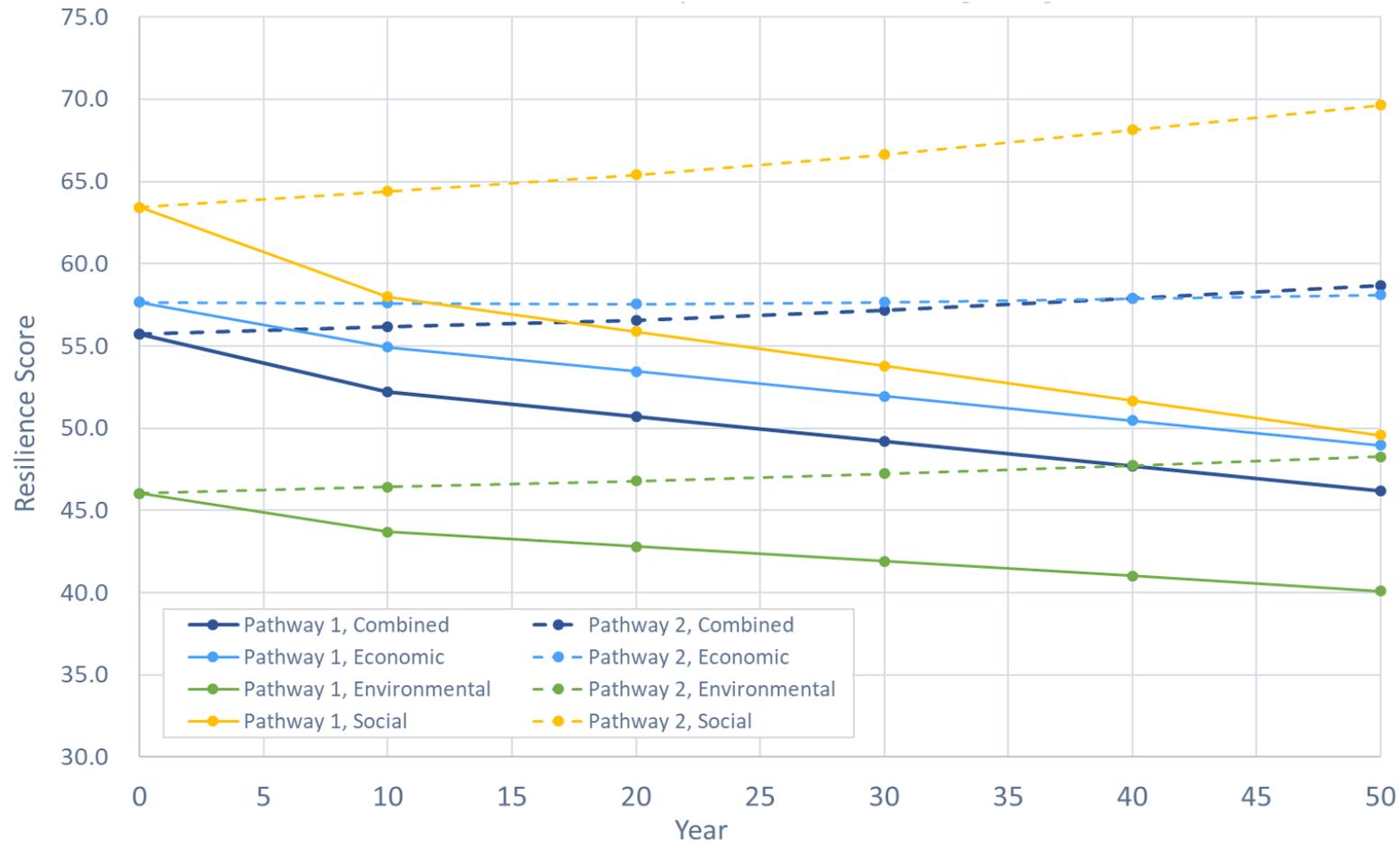
Pathway 2

- Additional emphasis on emergency response, evacuation measures and community understanding of residual risk
- Support for flood proofing towards end of period

Illustrates how policies and actions, other than coastal defences, can increase the communities resilience

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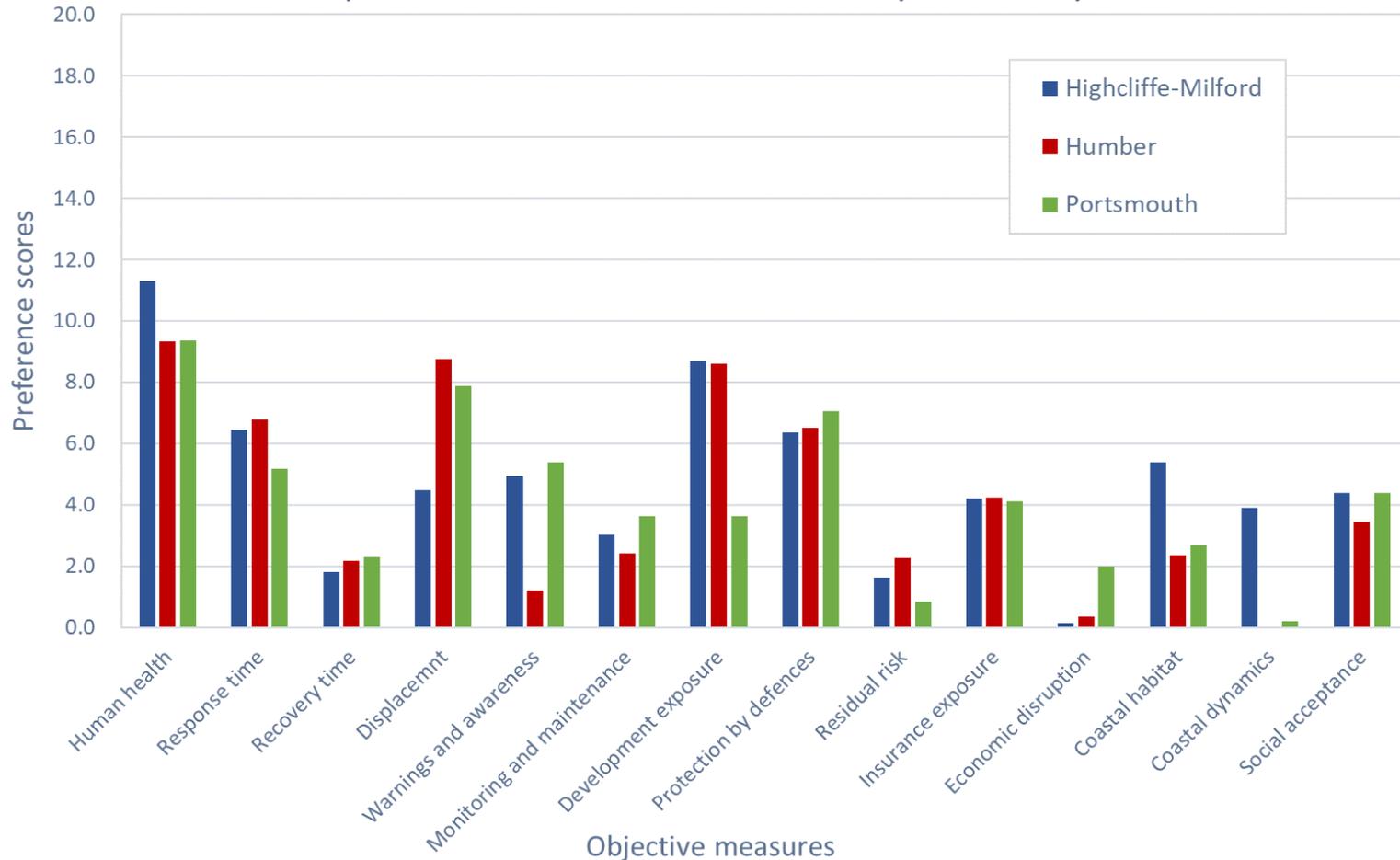
Illustrative study 3



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How the measures compare

Comparison of Case Studies for Pathway 2 at t=50 years



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Summary of findings (1)

- Multi-dimensional problem
 - Objectives (and associated measures)
 - Policy option pathways (time dependent)
 - External drivers (time dependent)
 - climate change, government policy, demography, etc
- Suite of Measures provide a Resilience “signature”
- Policy options can alter multiple measures
- Modelling change in Measures over time in response to external drivers and policy pathways needs to be more rigorous than implemented for this demonstration

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Summary of findings (2)

- Sensitive to selection of measures and their scores and weights
 - Measures require in depth evaluation to ensure that they provide a comprehensive coverage that is necessary and sufficient
 - Scores need to be developed using national data sets
 - Weights require active engagement with stakeholder groups
- Retaining different perspectives (weightings) may be helpful when evaluating the implications of particular combinations of Coastal Resilience Policies
- Testing at a national scale should help inform whether the framework is robust and operable at local and national levels

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Glossary

Term	Definition
Objectives	Defines the purpose – what one is aiming to achieve. In this case enhanced coastal resilience
Measures	Assess how well the objectives are being met (sometimes referred to as criteria)
Policy Options	The actions that can be used to deliver the objectives
Scores	A means of transforming the measures to a common scale
Weights	A form of ranking to reflect the relative importance of the measures

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Tea and coffee

(please have a five minute comfort break and bring tea and coffee back to your seats)

Q&A and critique



Synthesis, open discussions and next steps

Chair: Robert Nicholls



Summing up

- Project results to date – summarised in the Handout – still being developed and the input from today will contribute.
- Project outputs:
 - Our intension is to produce a summary of these meetings aimed at different audiences (see Handout).
- We will update you with progress from the project. We hope that you are happy to be kept on the mailing list in case of any future projects.
- If you have ideas of individuals who would like to join this mailing list, please email Sally Brown (sb20@soton.ac.uk)

