Welcome to the launch event for

Dynamic Coast

Scotland's National Coastal Change Assessment

Jim Hansom, James Fitton and Alistair Rennie

Scottish Government
Riaghaltas na h-Alba
gov.scot

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

crew
Scotland's centre of expertise for waters

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

University of Glasgow

SEPA

National Library of Scotland
Leabharlann Nàiseanta na h-Alba

Ordnance Survey

Adaptation Scotland
supporting climate change resilience

Fife Council

SCAPE

Welcome & Launch

Roseanna Cunningham MSP

Cabinet Secretary for the Environment, Climate Change and Land Reform

Key points from NCCA

Dr. Alistair Rennie (Project Manager):

SNH and Scottish Government

What has been found?

Prof. Jim Hansom (Principal Investigator):

School of Geographical and Earth Sciences,

University of Glasgow

Why should the coast be important to you?

Source

Scotland's scenic and important coast

The coast is a key resource and home to communities, businesses, infrastructure as well as our playground:

Its stability is exploited by, and underpins, key industries, transport links, ports and harbours (imports and exports: food and drink), tourism, energy production. 20% of Scots live within 1 km of the coast (ca. 1m people)

A problem of perception?

So why do we regard coastal change (erosion and accretion) as unimportant?

"Scotland is uplifting out of the sea, isnt it?" Fallacy 1

"erosion isn't a problem and wont be in the future" Fallacy 2

"anyway, its only golf courses at risk" Fallacy 3

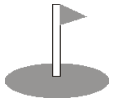
Monifieth (Angus)

Balavanich (WI)

A problem of perception?

So what assets are at the coast?

"its only golf courses at risk"



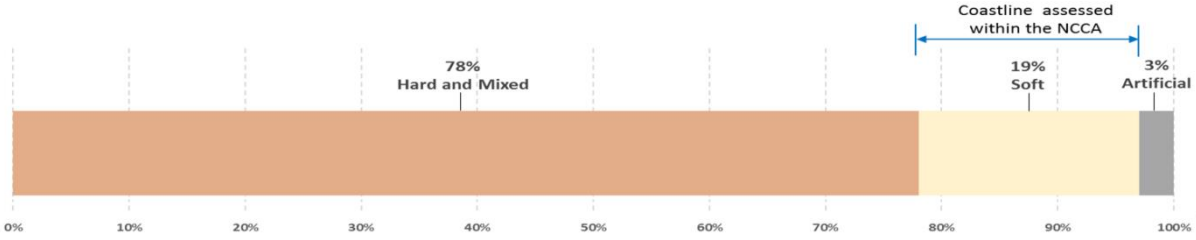
# of coastal assets within 50m of the coast	
113 golf courses	1/5 of Scotland's golf courses are coastal & of these 1/4 already have coastal erosion problems
34,000 buildings	1% of Scotland's houses are within 50m of the coast 72% are residential properties As many are protected by natural defences as engineered ones.
1,300 km roads	… are within 50m of the coast
100 km rail	
800 cultural sites	
600 natural heritage sites	

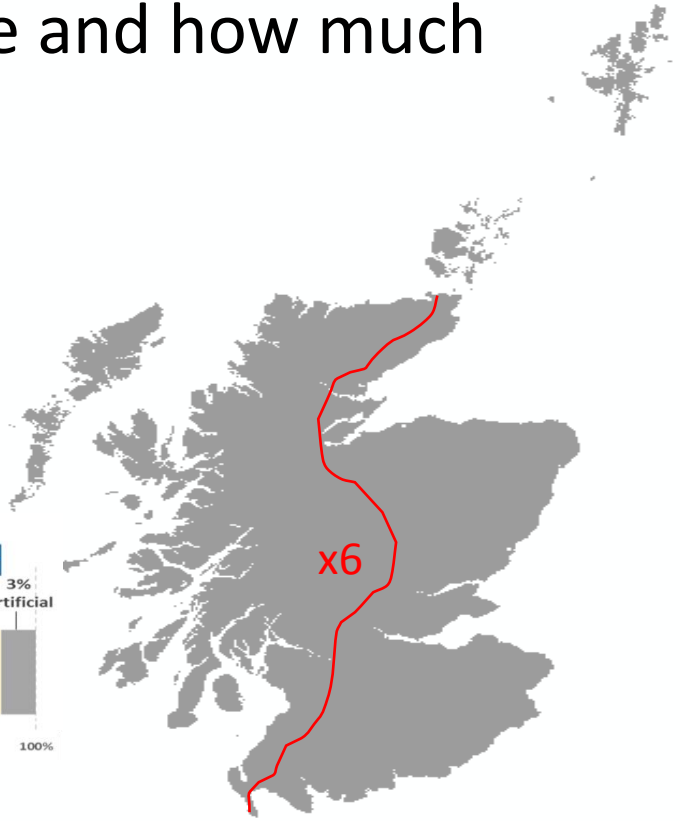
What is ‘erodible’, what has eroded?

How much of our coastline can erode and how much has eroded?

Scotland’s coast is 21,000km long*

19% of coast is ‘erodible’ … ‘soft’





3,802 km is classified within NCCA as soft

* Length of MHWS t the most detailed mapping scale

What is ‘erodible’, what has eroded?

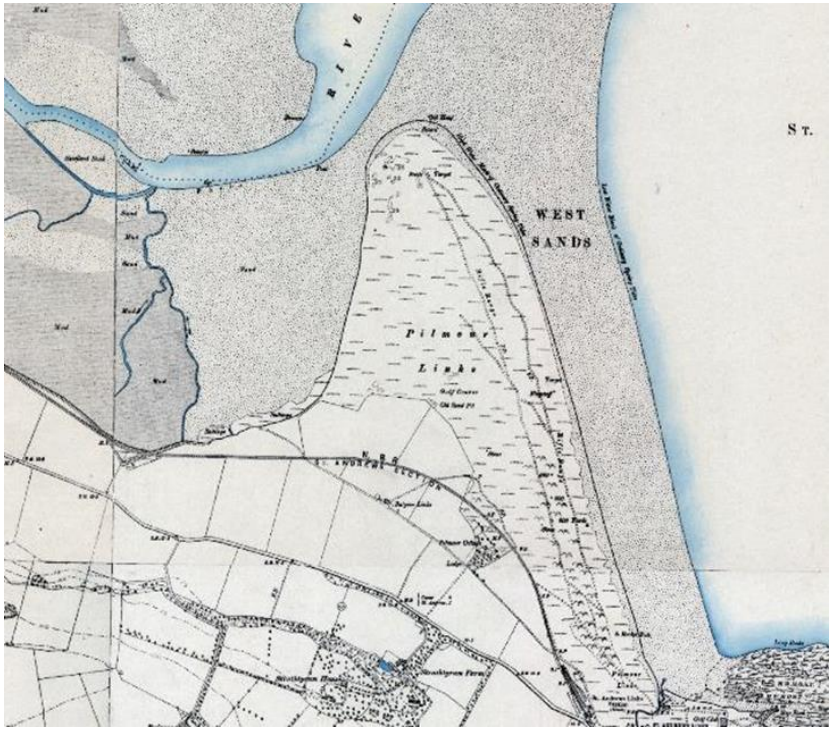
NCCA Methodology:

Compare 3 shorelines using Mean High Water Springs (MHWS) from:

1890s

1970s

Modern



source

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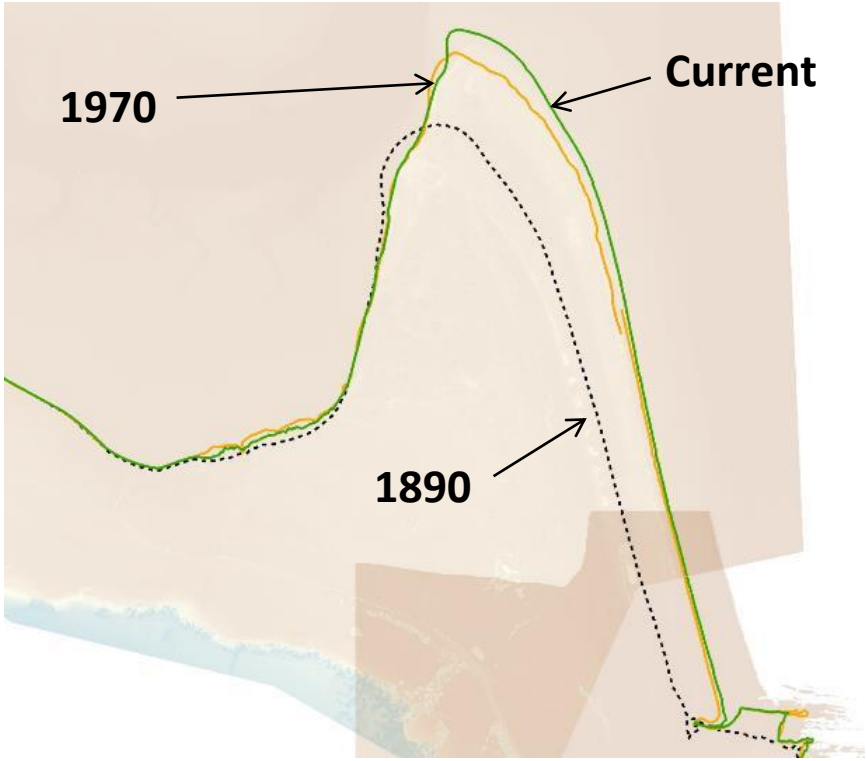

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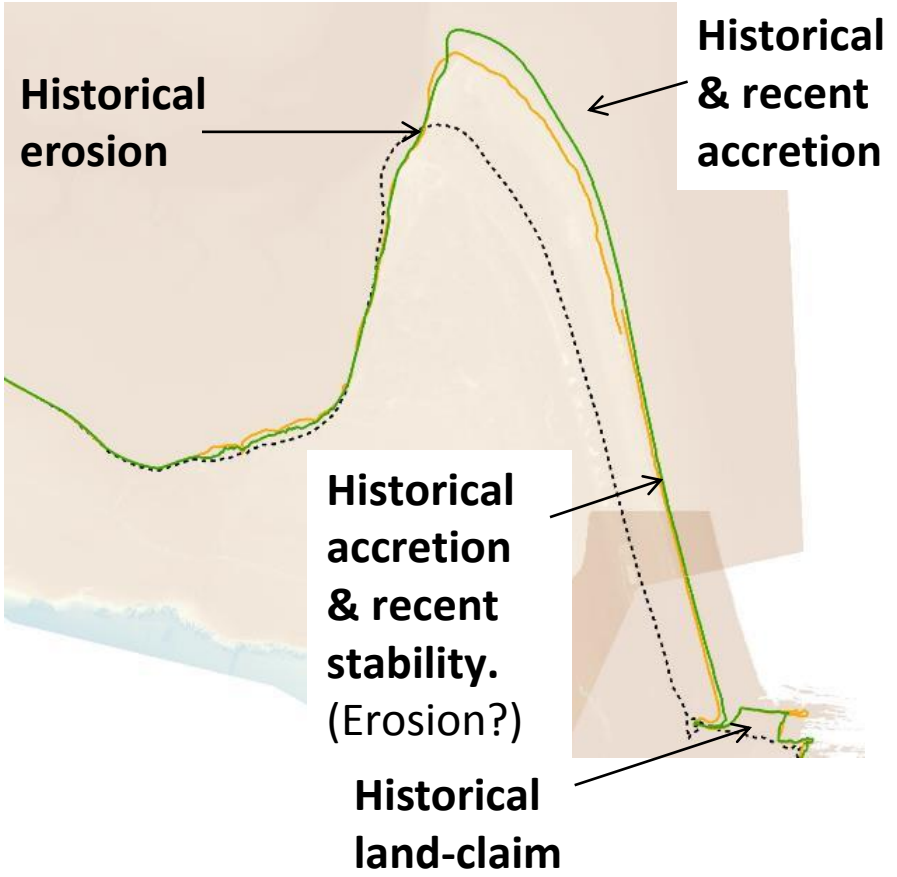

source

Scottish Government
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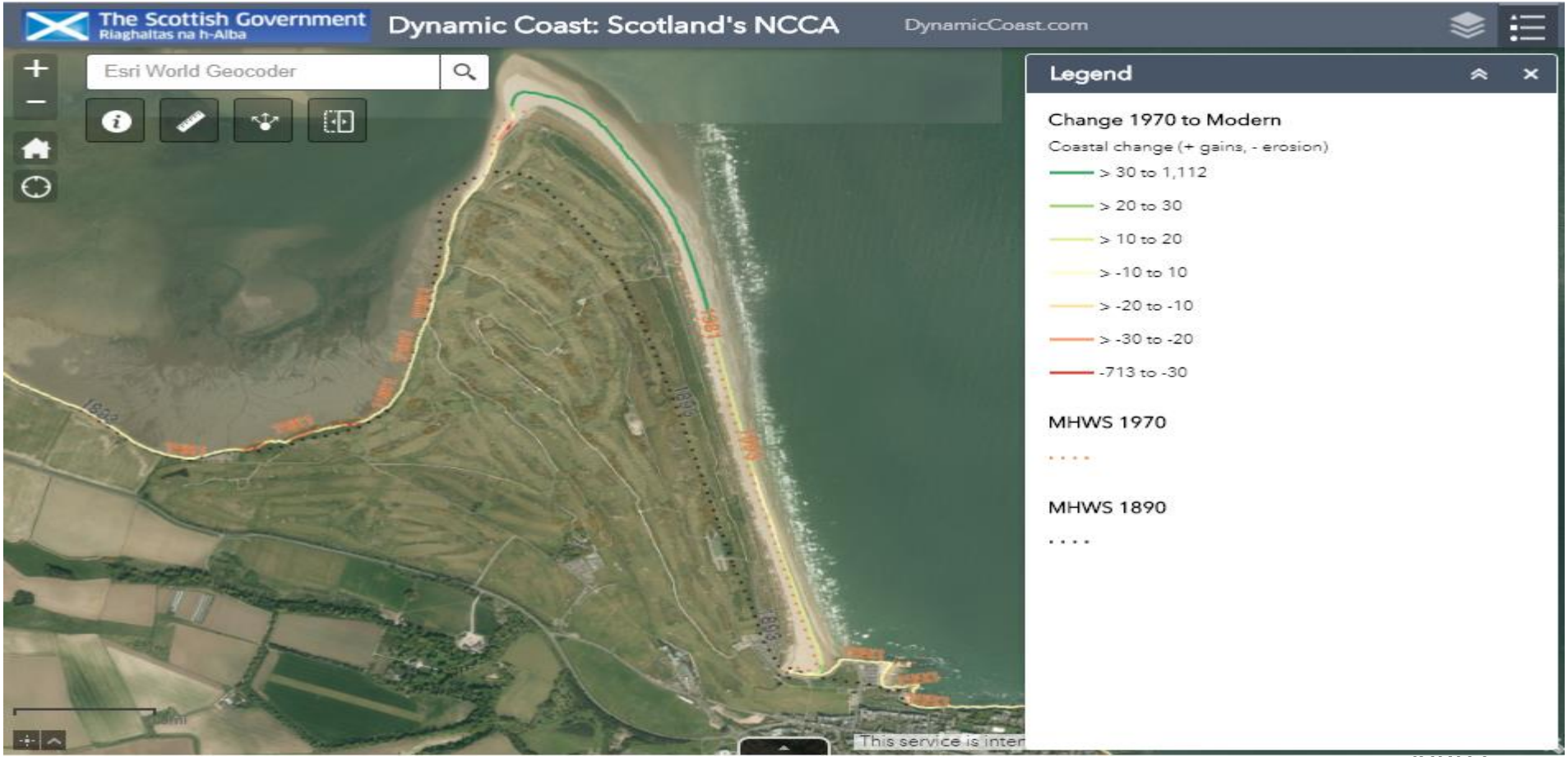
Web map results



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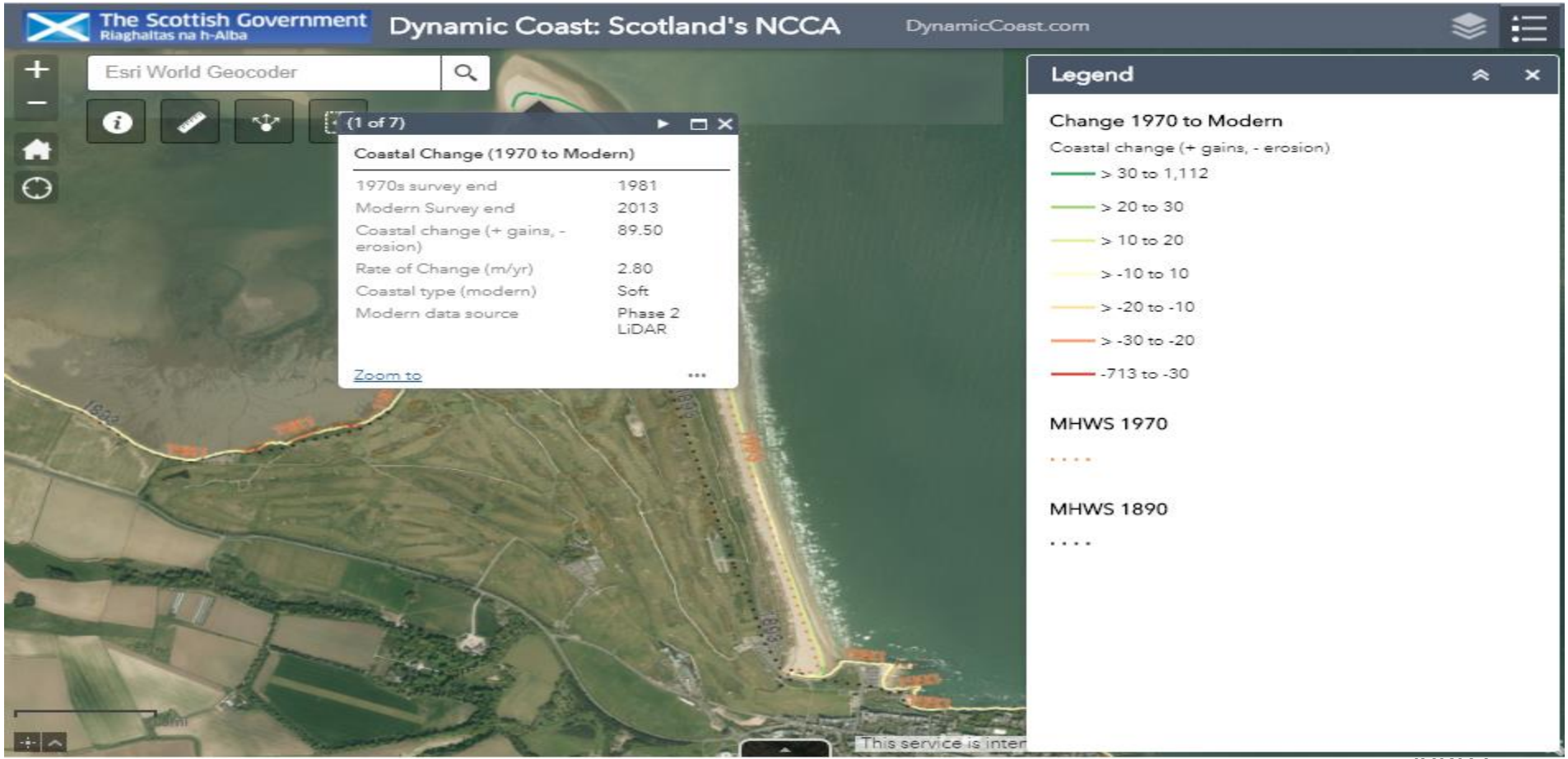


What is ‘erodible’, what has eroded?

How much of our coastline can erode and how much has eroded?

77% of soft coast could move but hasn’t

11% soft coast has advanced more than 10m seaward

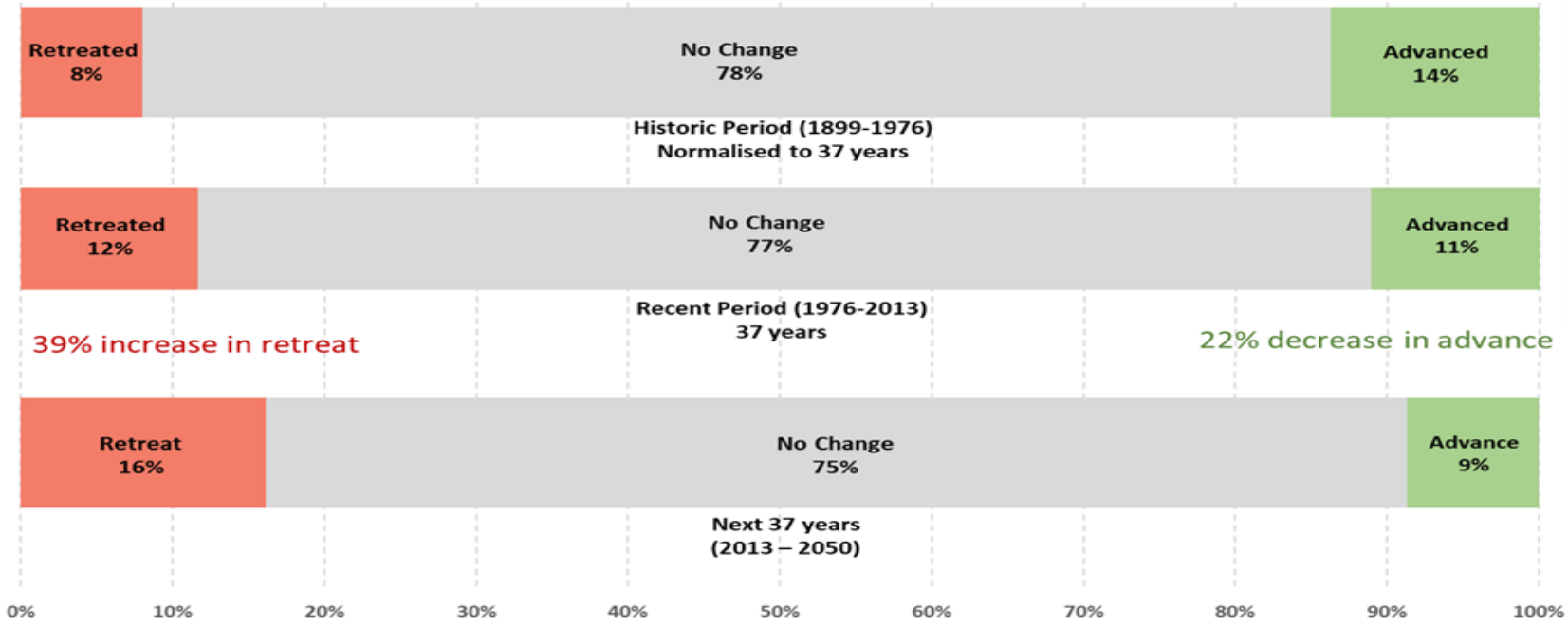
12% soft coast retreated more than 10m landward

… since the 1970s

423 km has advanced (accreted); 442 km has retreated (eroded)

How is this changing through time?

Comparing the map evidence, we know and project that….



8% erosion increases to 12% …. 14% advance falls to 11% ….. 39%↑ extent retreating & 22% ↓ extent advancing.

Average erosion rate was 0.5 m/yr historically but now doubled to 1 m/yr

Modern rate projected over next 37 years produces 16% retreat and 9% advance

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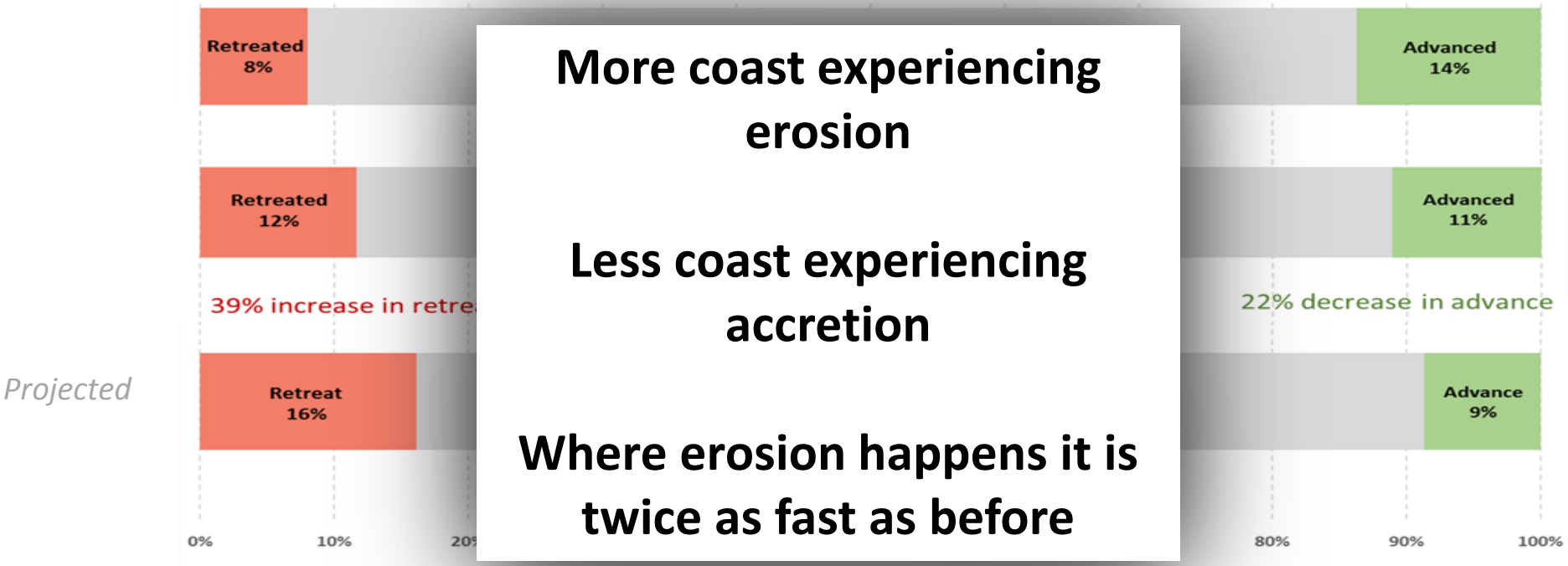


More coast experiencing erosion

Less coast experiencing accretion

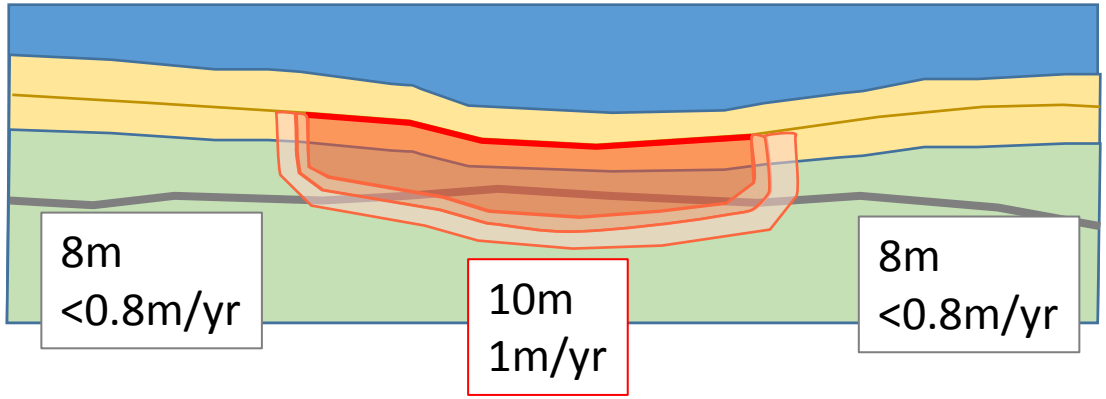
Where erosion happens it is twice as fast as before

8% erosion increases to 12% …. 14% advance falls to 11% ….. 39%↑ extent retreating & 22% ↓ extent advancing.

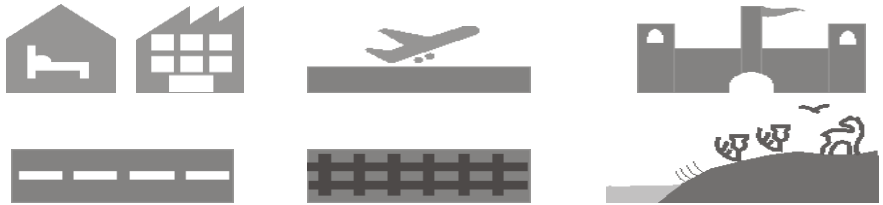
Average erosion rate was 0.5 m/yr historically but now doubled to 1 m/yr

Modern rate projected over next 37 years produces 16% retreat and 9% advance

If recent erosion rate continues to 2050, can we identify an indicative shoreline?



What assets may be affected?



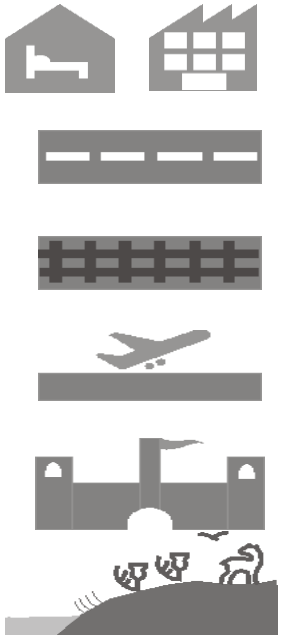
Indicative Vulnerability Assessment

If recent erosion rate continues by 2050?

(Indicative #)	**at risk**	**nearby**	
	52	448	buildings
	5 km	15 km	road
	2 km	2 km	rail
	1 ha	2 ha	runways & taxi aprons
	26 ha	41 ha	cultural heritage
	447 ha	437 ha	natural heritage

Indicative Vulnerability Assessment

If recent erosion rate doubles by 2050? (2050+)

(Indicative #)	**at risk**	**nearby**	
	~~52~~ 150	~~448~~ 625	buildings
	~~5~~ 10 km	~~15~~ 18 km	road
	~~2~~ 2 km	~~2~~ 3 km	rail
	~~1~~ 4 ha	~~2~~ 3 ha	runways & taxi aprons
	~~26~~ 27 ha	~~41~~ 41 ha	cultural heritage
	~~447~~ 670 ha	~~437~~ 400 ha	natural heritage

Past erosion ≠ future erosion

These assets lie behind known erosion…

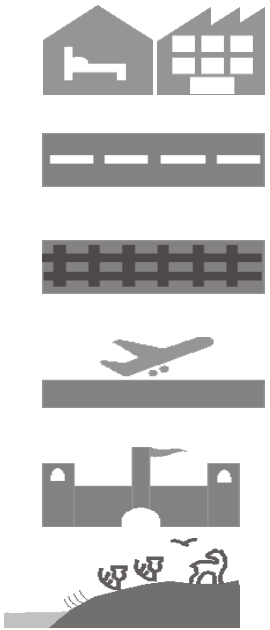
but the extent and rate of erosion has already increased, so what assets are at risk as erosion quickens and expand into new areas as yet unaffected by erosion?

Specifics to be considered in the next stage (NCCA2), but the patterns are clear…

Whole Coast Assessment

How many assets are on the soft coast?

Lots!



Total number of assets within 50m of MHWS

Anticipated (2050) recent rate	Anticipated (2050+) double rate	All	Hard & Mixed	**Soft**	**% in soft coast**	Artificial	
52	150	33,494	14,359	9,503	27%	9,632	Buildings
5	10	1,336	733	497	37%	107	Roads (km)
2	2	104	27	58	56%	18	Rail (km)
1	4	3	2	0	11%	1	Runways (ha)
26	27	1,029	471	438	43%	120	Cultural (ha)
447	670	23,430	14,873	8,424	36%	133	Natural (ha)

Whole Coast Assessment

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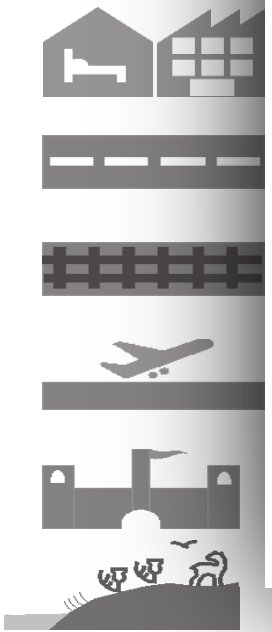


Total number of assets within 50m of MHWS

Buildings
Roads (km)
Rail (km)
Runways (ha)
Cultural (ha)
Natural (ha)

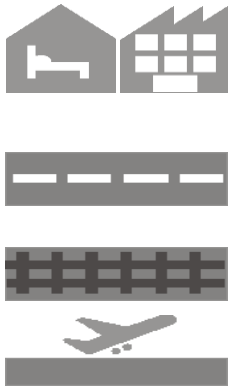
Wide range of assets identified at risk from future erosion

Many more assets benefit from the soft coast

Artificial protection requires ongoing maintenance

What is the current values of these assets?

Estimated value (2017) of assets on the soft coast



Total number of assets within 50m of MHWS

		Whole Coast Assessment				Anticipated erosion			
		Soft coast		Artificial coast		2050		2050+	
	Replacement cost per unit	# Assets	Value (£m)	# Assets	Value (£m)	# Assets	Value (£m)	# Assets	Value (£m)
Buildings	£143,282	9,503	1,362	9,632	1,380	52	7	150	21
Roads (km)	£6,500,000	497	3,231	107	696	5	33	10	65
Rail (km)	£150,000,000	58	8,700	18	2,700	2	300	2	300
Runways (ha)	£300,000	0	0	1	0	1	0	4	1
Total value (£)			£13 bn		£5 bn		£340m		£388m

What is the current values of these assets?

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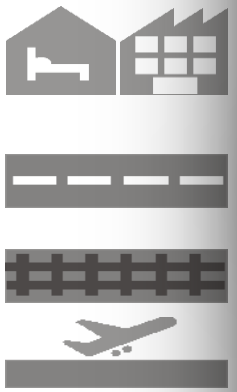


Higher value of assets behind soft shore

Need to value (£) and maintain the essential services provided by natural defences

But can we infer from the changes between historical and recent periods, which areas are at greater risk?

Yes…

f MHWS

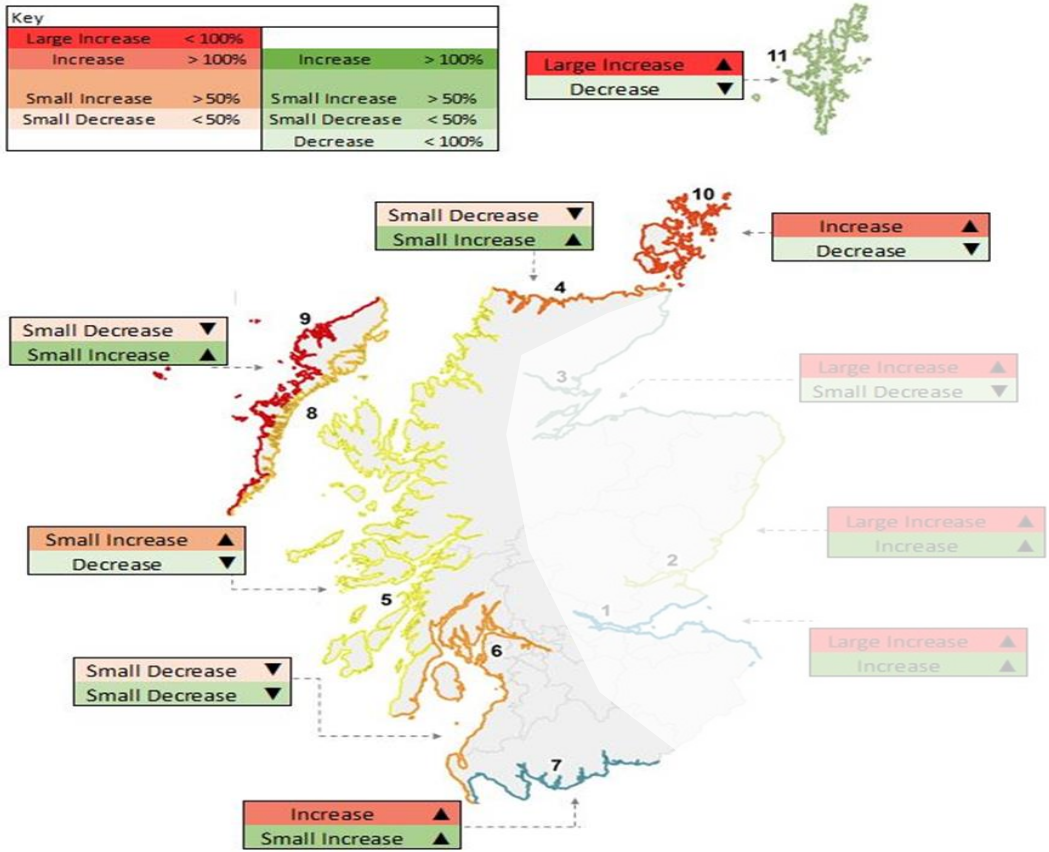
erosion	
2050+	
# Assets	Value (£m)
50	21
10	65
2	300
4	1
	£388m

Past erosion rates ≠ future erosion rates

The open **east coast:** the greatest increases in erosion since 1970s.

- more developed with towns, buildings and infrastructure
- beaches have less natural protection from rock headlands
- greater pressure from negative impact of defences and dredging.

Changes between historical and recent periods



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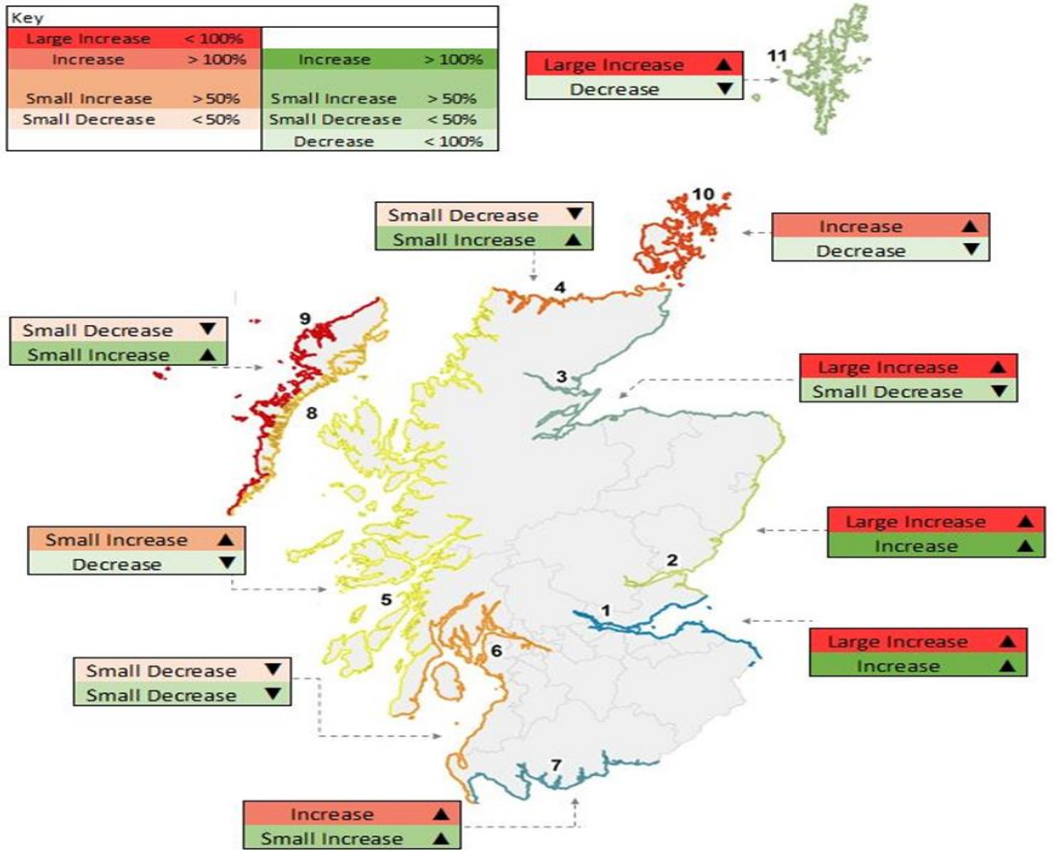
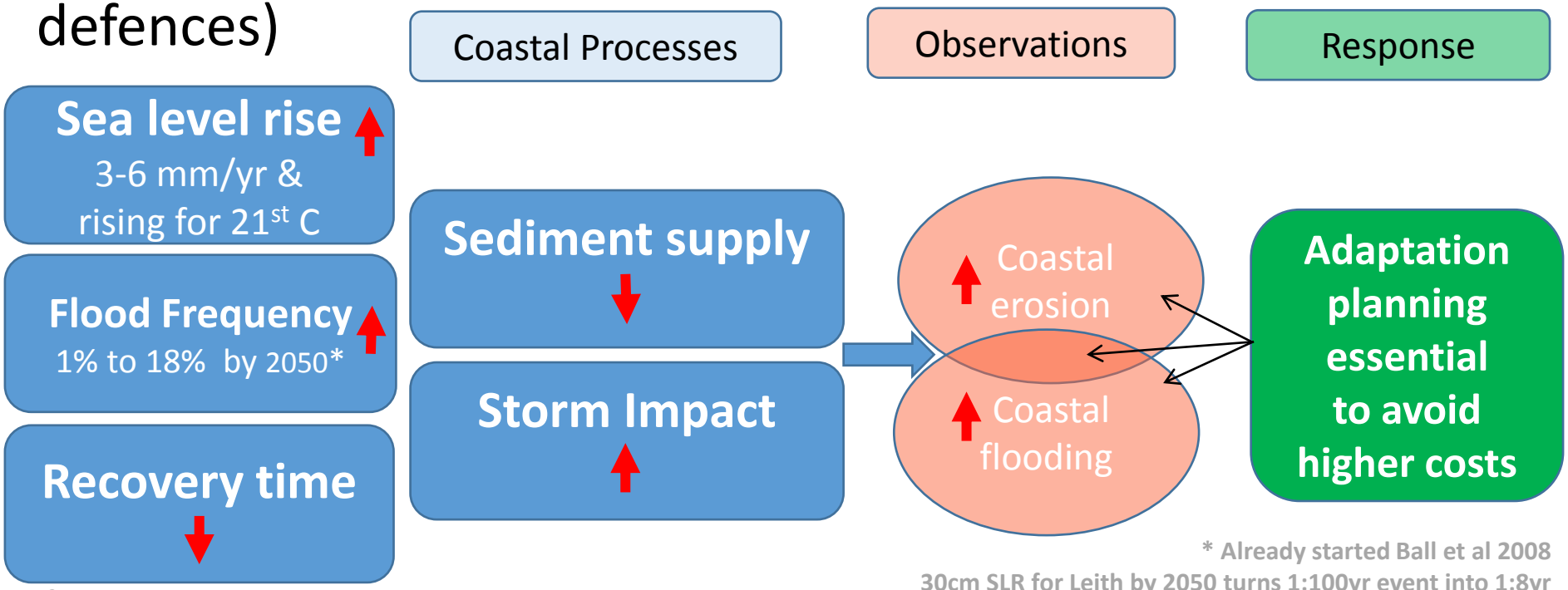


All key drivers are set to worsen: many of our past management approaches have not helped (dredging & defences)



* Already started Ball et al 2008

30cm SLR for Leith by 2050 turns 1:100yr event into 1:8yr

(UKCP09 High Emission Scenario 95% level for Leith & Defra (2012) UKCCRA for Scotland)

"The pattern is entirely consistent with climate change."

No surprise to many,

but the underlying adaptation message isn't getting through to others…

Engineered defences may not be sustainable everywhere… time to adapt & move?

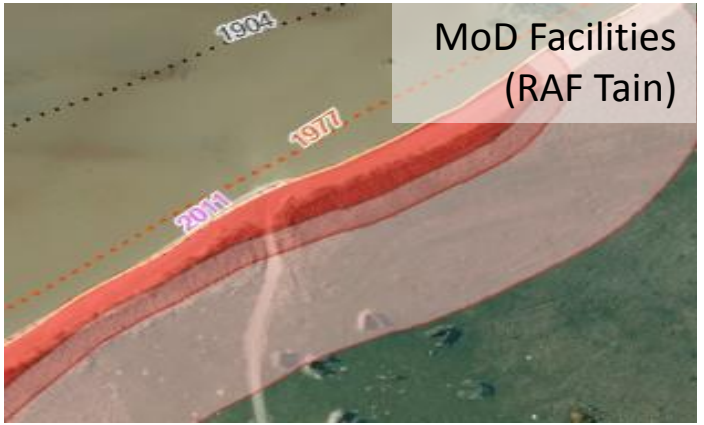
S. Uist, W. Isles, boulder protection of an easily rerouted minor road post 2005 storm, bypassed by storm wave overwash at sides as erosion continues.

Prestwick, unprotected main wastewater pipeline emerges from boulder protection, itself inserted to prevent contaminated rubble from beach access.

Adaptation has been planned at Montrose Golf course for 13 years. But limited appeal and adaptation so far. Flood study planned.

Indicative Vulnerability Assessment

"NCCA identifies all asset types are at risk by 2050"



Today…

Evidence is clear:

- More and faster erosion is already occurring;
- Future risks to assets are increasing;
- Resources are under continued pressure so targeted funding decisions need to be made;
- Government leadership/ambition is clear;
- Integrated approaches needed (£ & outputs);

- Need for public sector action now, to plan and implement adaptation where possible.

Combined threats need integrated solutions

Coastal flooding and coastal erosion often operate together, both are set to worsen.

Such ***in-combination*** effects will become a significant problem for Government, Authorities and Society.

They need to be treated together.

“The future is already here.”

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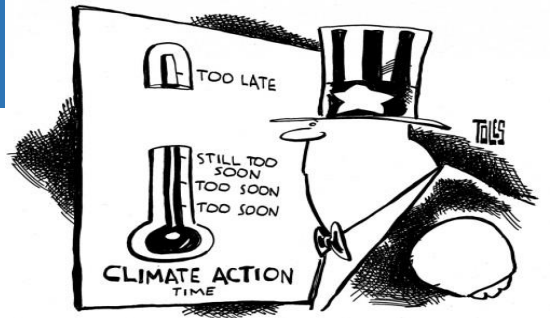
A window of opportunity



We now have a window of opportunity to adapt in advance of future problems/costs.

Integrated action now via:

- Scottish Climate Change Adaptation Programme,
- National Marine Plan,
- Regional Marine Plans,
- Shoreline Management Plans,
- SMP-lite,
- Flood Risk Management Plans.

Golspie (2014) ©Northern Times

Crux is for agencies and authorities with a coastal remit to buy-into and deliver policies (via named internal coastal champions?)

Thanks to the:

Scottish Government, Crew, NCCA Steering Committee and your attendance today.

Questions

Ali & I are free for questions.

Demonstration on laptops

James will do a demonstration

of the web maps shortly

www.DynamicCoast.com

Steering Committee:

Debi Garft	Scottish Government
Alan Corbett	Scottish Government
Kat Ball	SEPA
Alistair Cargill	SEPA
Mairi Davies	HES
Nicholas Williamson	Fife Council
Tom Dawson	SCAPE
Tracy McCollin	Scottish Government
Duncan Moss	Ordnance Survey
Jannette MacDonald	CREW
Emily Hastings	CREW