

Scotland's Dynamic Coast: The National Coastal Change Assessment

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Presentation Outline

1. Introduction to Scottish Coast

- Why is understanding coastal change important in Scotland?

2. What is the NCCA

3. Methods

4. Results and Outcomes

5. Conclusions

Scottish coastal assets

Population

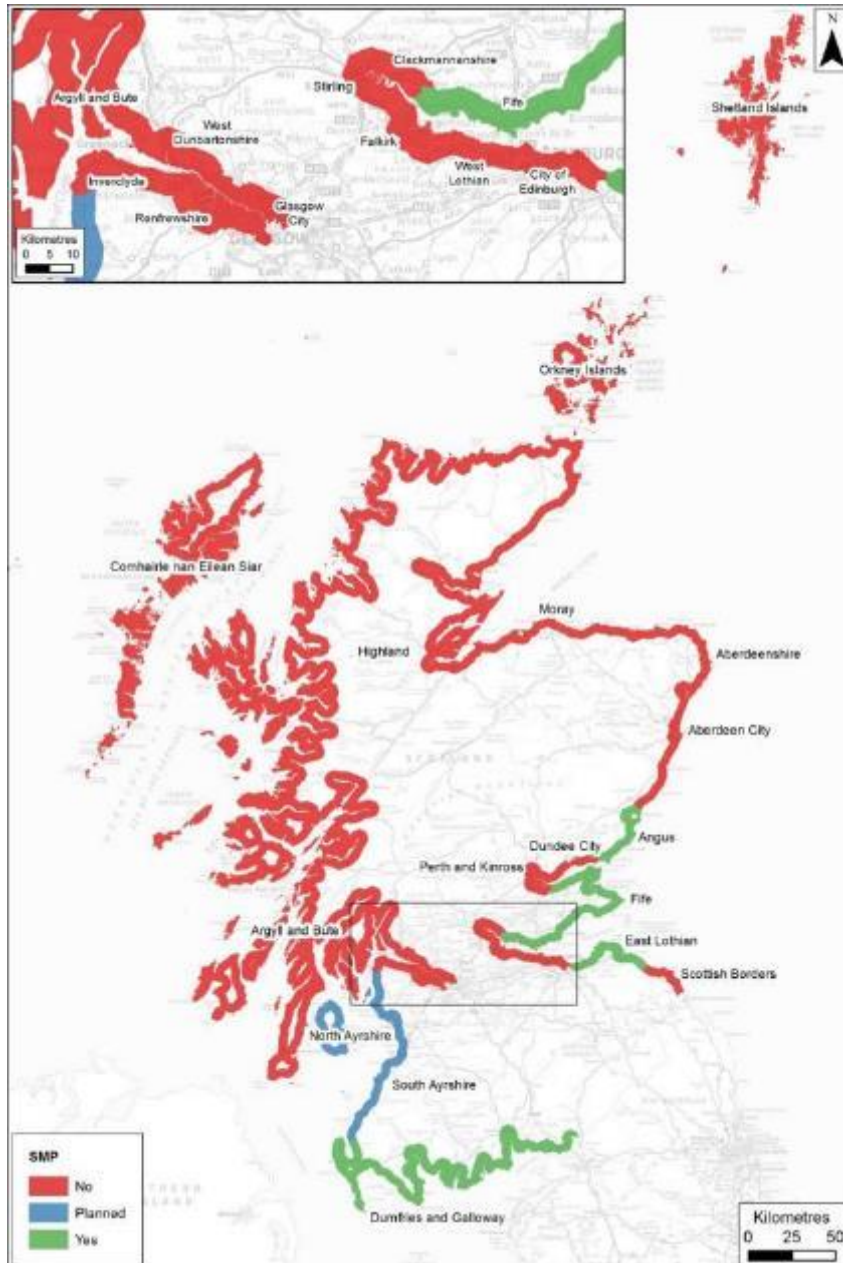
- 20% of the Scottish population live within 1km of the coast (1 million)
- ~12 % of European coast (Pranzini and Williams 2013)
- Highly variable: resilience & assets



Paradox of Coastal Erosion in Scotland

- Many organisations have an obligation to incorporate coastal erosion within their statutory advice. Yet **there is no centralised national dataset on coastal erosion** – no single organisation has responsibility.
- Part of this is due to the devolved nature of erosion, where it is the responsibility of the landowner. **The LA normally intervenes when there is a flooding concern.** This means the LA may be aware of issues, but there is no national oversight.
- Any organisation will struggle to objectively appraise the risk coastal erosion poses **to it's own interests, let alone collaborate with others.**

Current Data on Erosion



UK CCRA (2012) noted this as an evidence gap in Scotland:

‘Maps of past erosion, current state and future erosion conditions are required.’

Defra (2012) UKCCRA for Scotland - Final Report. p191

- Angus and Fife both have an SMP

What's coastal erosion got to do with flooding?

Sea levels are rising across Scotland and this is already leading to increased flood occurrences. e.g. Aberdeen,

Millport and Stornoway. Ball T, Werrity A, Duck RW, Edwards A, Booth L & Black AR. (2008)

Coastal flood risk in Scotland is expected to grow most rapidly in the coming decades. Estimated increase in total properties at risk for a 10% AP flood:

10% AP (10yr)	Fluvial	Coastal	Surface Water
Current estimates	15,420	4,121	9,672
2035 estimates	18,456	6,107	12,052
Increase	3,036	1,986	2,380
% increase	19.7%	48.2%	24.6%

And this excludes erosion exacerbated flooding. SG & JBA (2014)

National Coastal Change Assessment (NCCA)

A major policy-driven pan-government research project collating data and information on historic and future coastal change.

NCCA has/will:

- Undertake a quality assessment on existing data
- Establish the past changes along Scotland's coastline
- Extrapolate the historic change into the future
- Undertake an initial assessment of societies' interests within these areas (road, railways, houses etc.)
- Review national and regional coastal policies



Enable Strategic Planning

Who is involved?



50+ organisations are involved in the development of the project, and will also have access to the outputs.

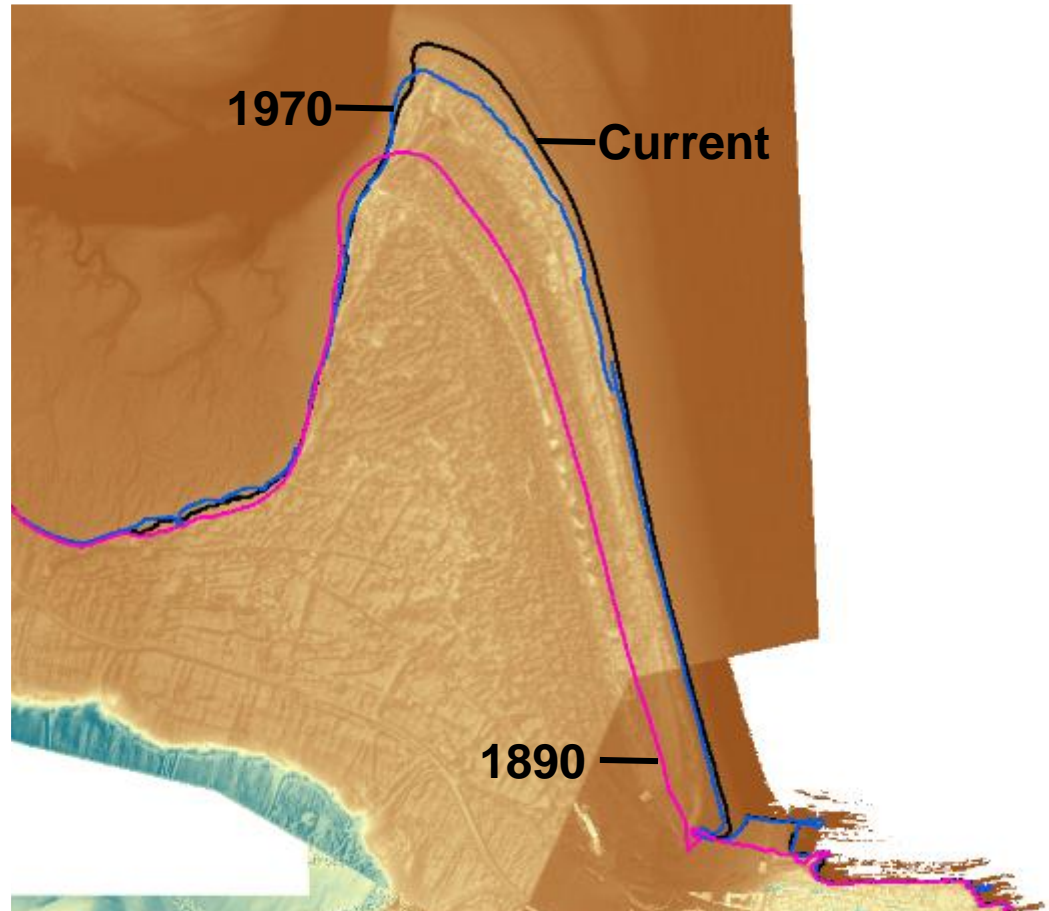
Who is involved?

Aberdeen City Council
Aberdeenshire Council
Adaptation Scotland
Angus Council
Argyll and Bute Council
BGS
Clackmannanshire Council
Clyde Forum
CnES
CREW
Crown Estates
Dept of Envi, NI
Dumfries & Galloway Council
Dundee City Council
East Lothian Council
Edinburgh City Council
Falkirk Council
Fife Council
FCERM.net
Forth Estuary Forum
Glasgow City Council
Herriot Watt University
Highland Council
Historic Scotland
Inverclyde Council
Keep Scotland Beautiful
Marine Scotland
MoD
Moray Firth Partnership
Moray Council
N.Ayrshire Council
National Library of Scotland
Orkney Islands Council
Ordnance Survey
Perth and Kinross Council
RCAHMS
Renfrewshire Council
RSPB
S.Ayrshire Council
Scottish Borders Council
Scottish Coastal Forum
Scottish Government
SEPA
Scottish Golf Environment Group
Scottish Golf Union
Shetland Islands Council
SNH
Solway Firth Partnership
St Andrews University
Stirling Council
Transport Scotland
University of Glasgow
West Dunbartonshire Council
West Lothian Council

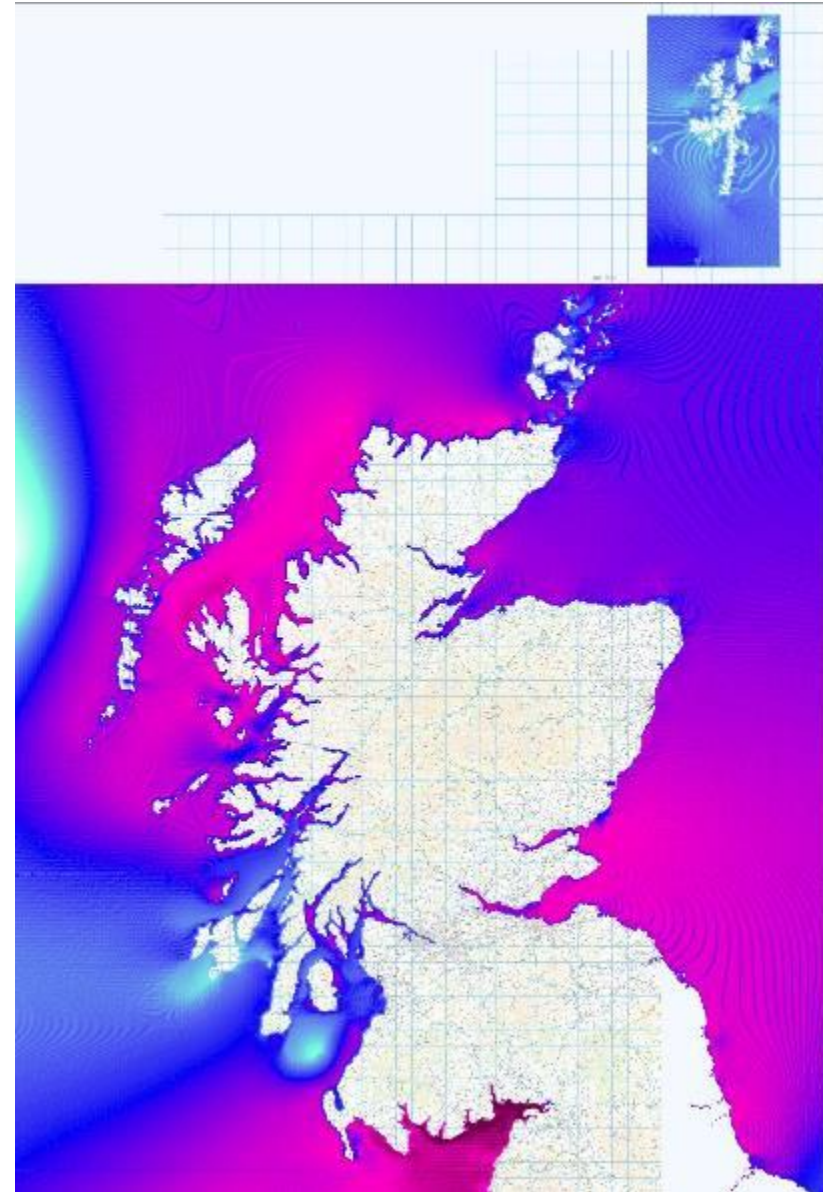
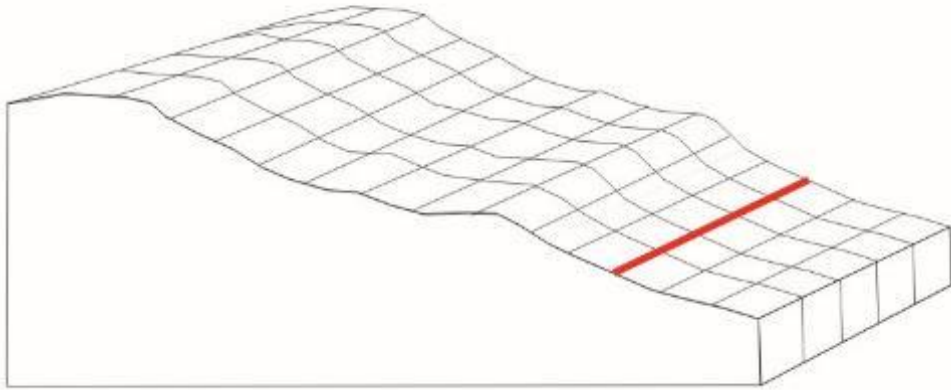
Funded by  Scotland's centre of expertise for waters
Scotland's centre of expertise for waters

NCCA Methods – Historic Change

- 1890s OS Second Edition Country Series Maps
- 1970s OS 1:10,000
- Current MHWS (derived from LiDAR/Aerial Photography)

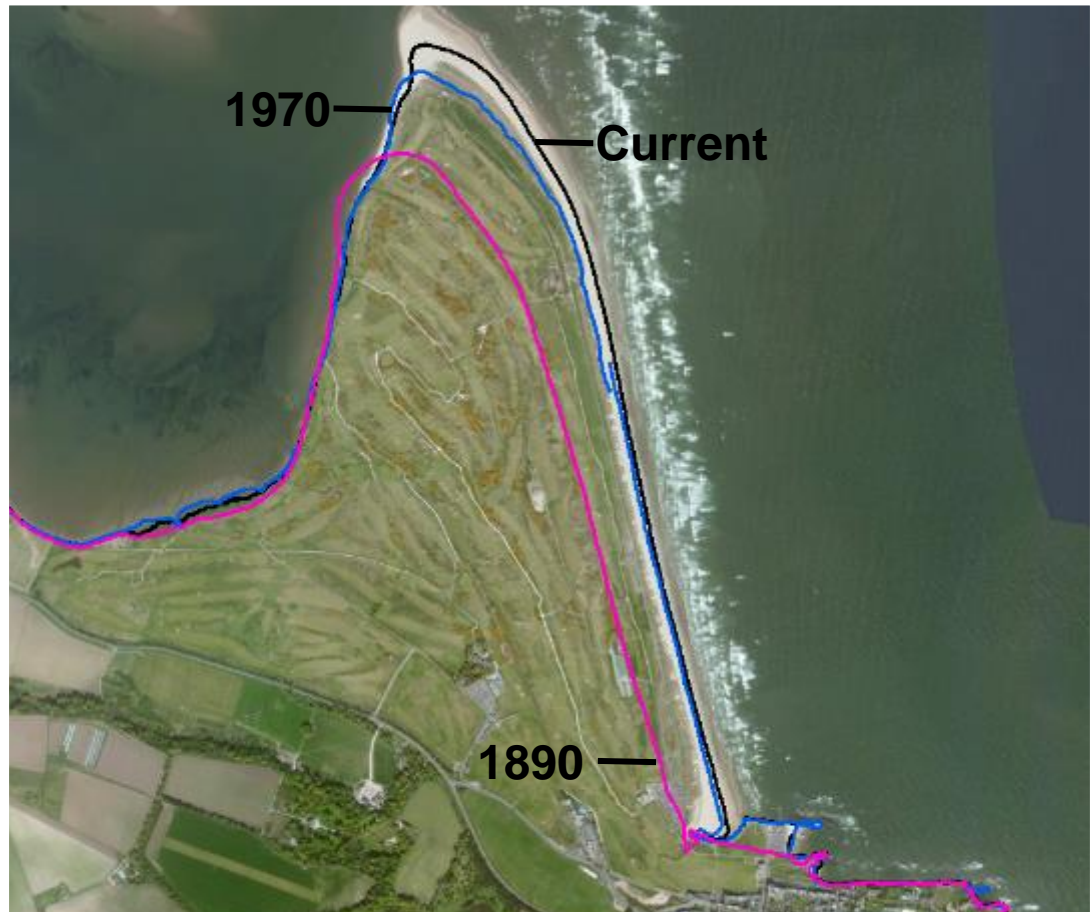


MHWS Extraction



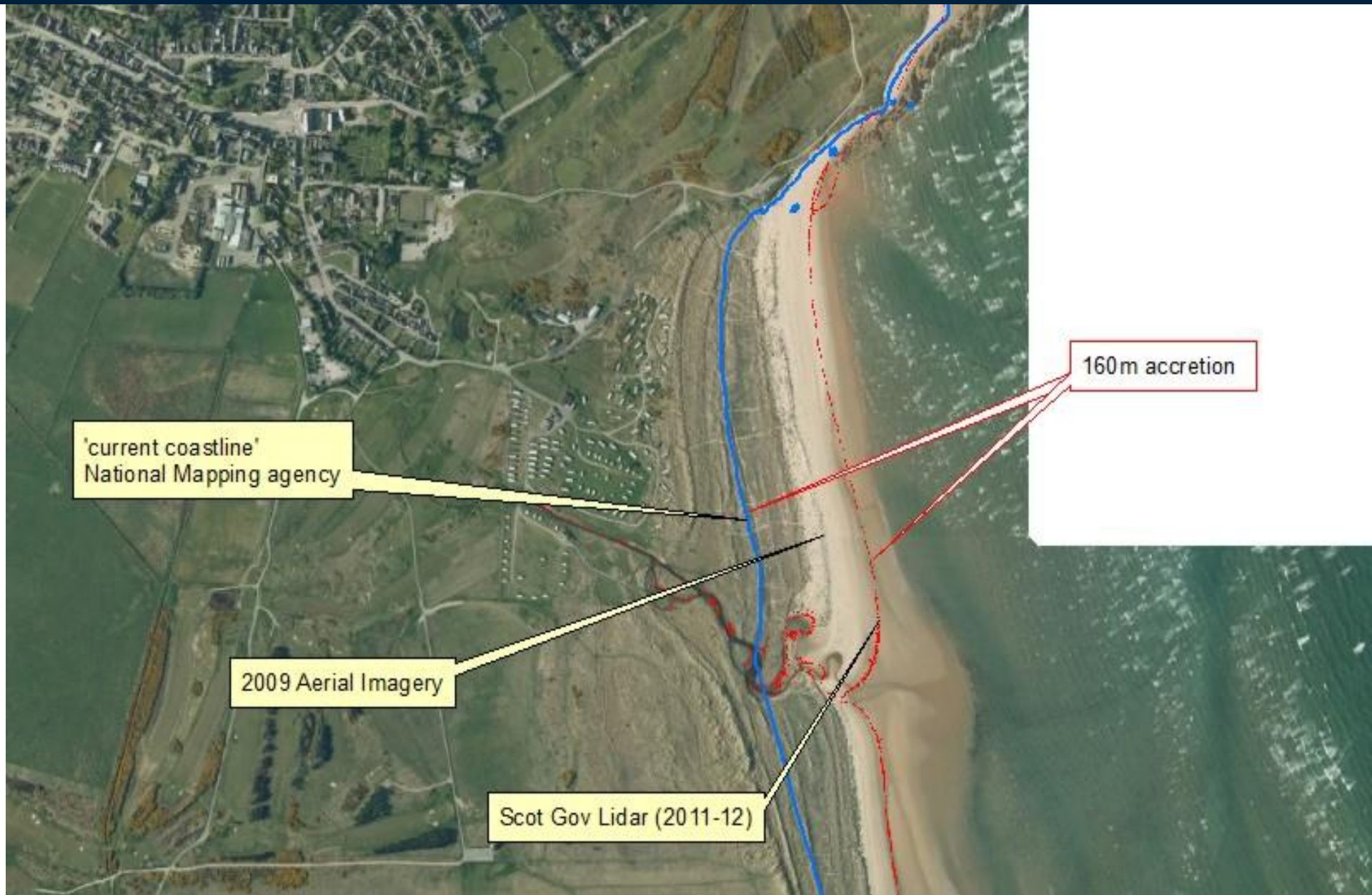
NCCA Methods – Historic Change

- 1890s OS Second Edition Country Series Maps
- 1970s OS 1:10,000
- Current MHWS (derived from LiDAR/Aerial Photography)



- Calculate the change rate between these lines (distance/time)

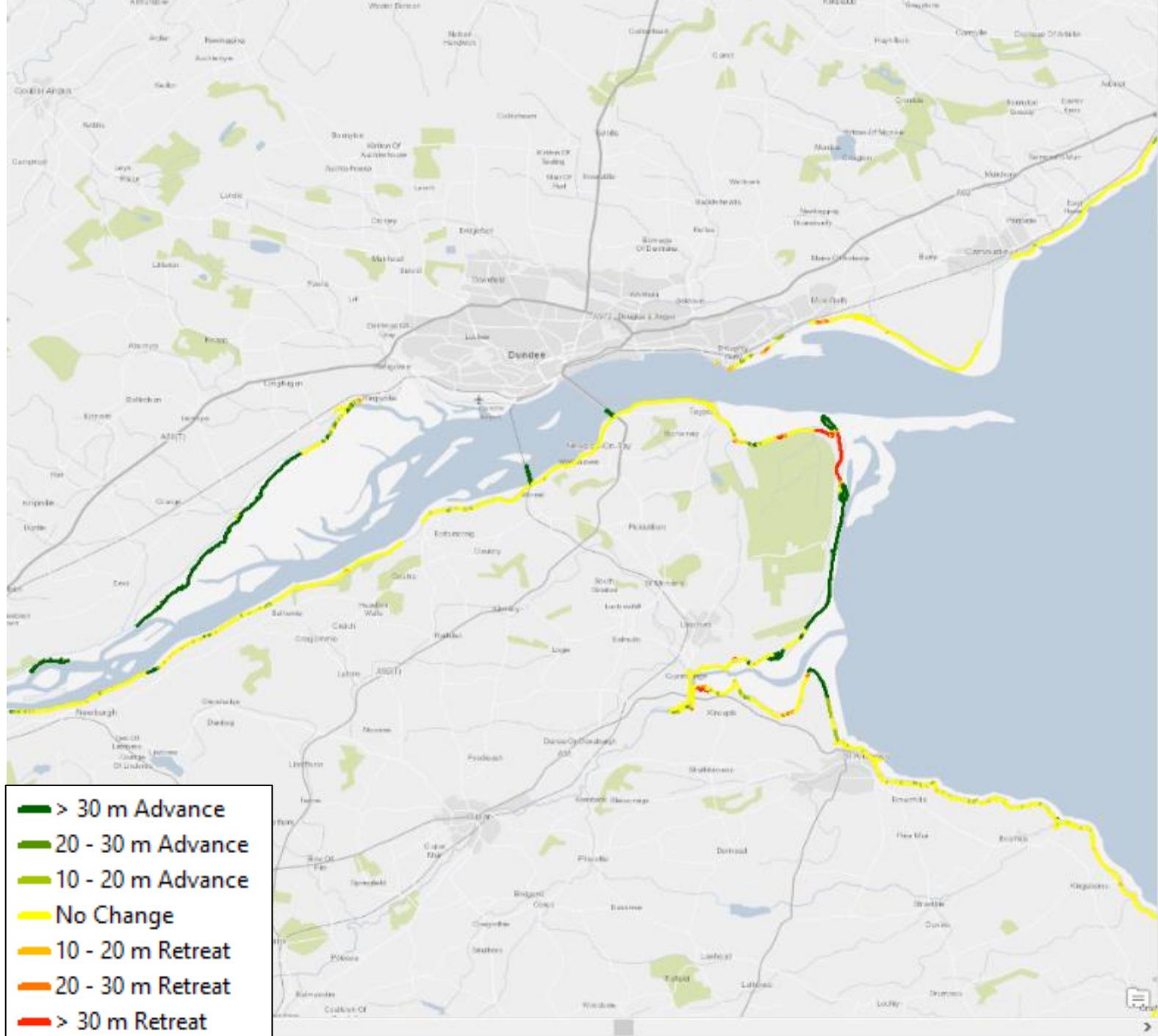
Use of OS MasterMap data



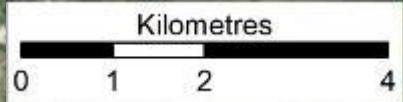
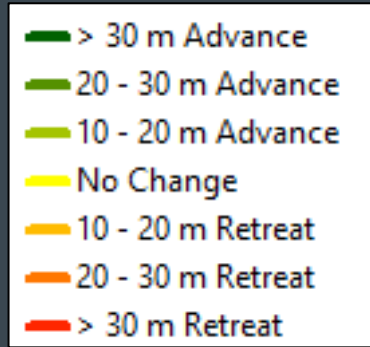
The NCCA has established...

- Scotland's coastline is **21,234 km** long
- **4,434 km** is soft / erodible
- SG LiDAR covers **1,710 km** of MHWS & will be used to update MHWS
- This leaves **2,724 km** which was checked to ensure it's accuracy
- Of this **2,297 km (84%)** was found to be representative
- **427 km (16%)** needed revision
- **120 km** updated using OS supplied DSMs
- **307 km** needs to be updated in the future

(all measured on OS MasterMap)



Fife – 1890s to 1970s



Source: Esri, DigitalGlobe, GeoEye, IGN, GeoEye, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Swisstopo, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Fife – 1970s to Modern



- > 30 m Advance
- 20 - 30 m Advance
- 10 - 20 m Advance
- No Change
- 10 - 20 m Retreat
- 20 - 30 m Retreat
- > 30 m Retreat

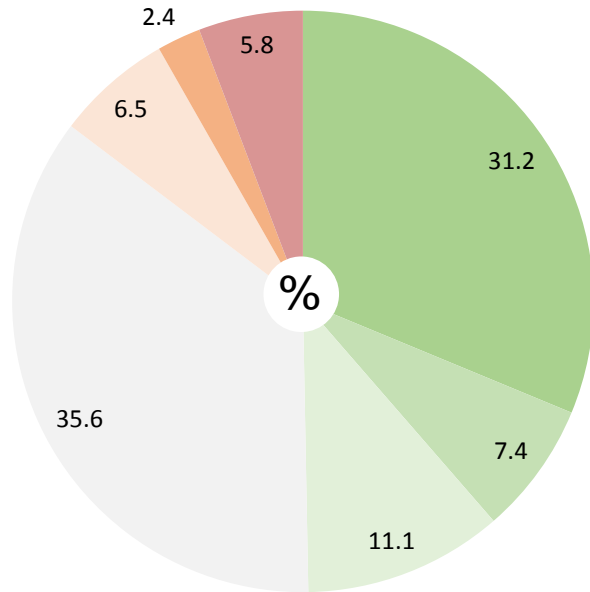
Kilometres
0 1 2 4

Source: Esri, DigitalGlobe, GeoEye, IGN, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Swisstopo, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Fife Statistics

1890s to 1970s

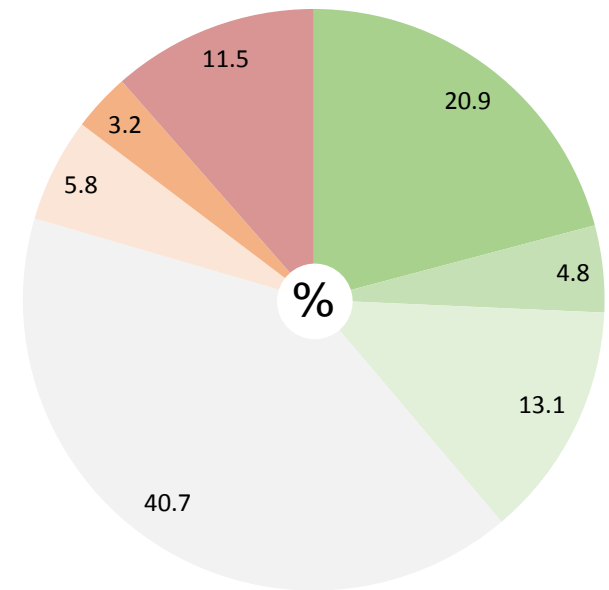
Fife Character	Length (km)	Length (%)
Hard & Mixed	74.1	33.9
Artificial	88.8	40.7
Soft	55.5	25.4
Total	218.4	100



Max Soft Advance (m)	537	North Tentsmuir
Average Soft Change (m)	25	
Max Soft Retreat (m)	556	South Tentsmuir

1970s to 2010s

Fife Character	Length (km)	Length (%)
Hard & Mixed	77.2	34.1
Artificial	87.4	38.6
Soft	61.8	27.3
Total	226.4	100

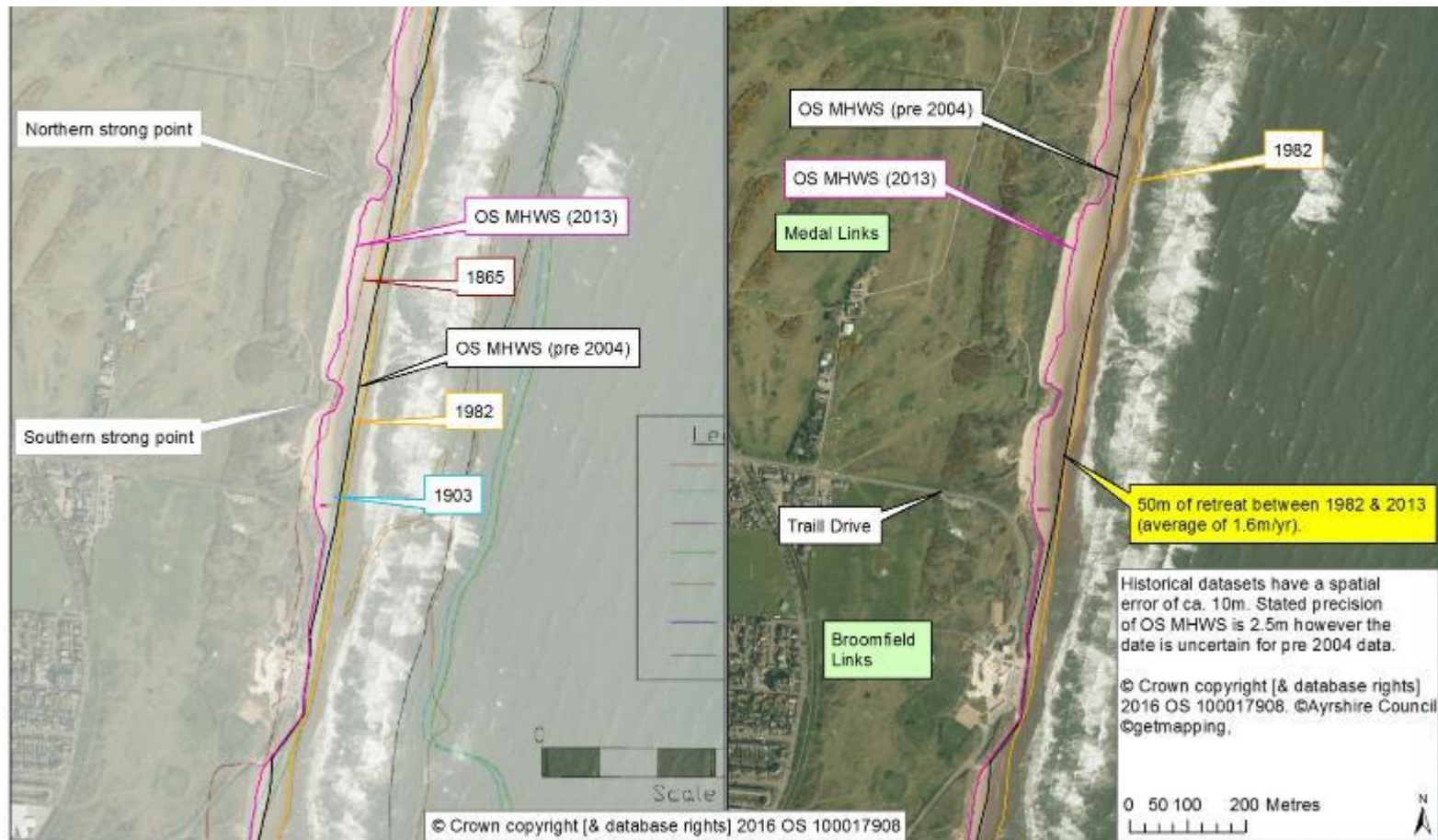


Max Soft Advance (m)	386	North Tentsmuir
Average Soft Change (m)	21	
Max Soft Retreat (m)	196	North Tentsmuir

Improving the evidence base (Montrose)

NCCA overlaid with Angus SMP

- Supporting a policy led approach to coastal management (better than reactive approach) thus supporting the LA as Coastal Protection Authorities
- Also informing Scottish Planning Policy, Flood Risk Management Strategies, Local Development Plans, Climate Change Adaptation Programme, National & Regional Marine Plans etc



Interim results available online...

www.dynamiccoast.com

Scotland's Dynamic Coast

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Scotland's Coastal Change Assessment

About the Project See the Web Maps

The Scottish Government
Riaghaltas na h-Alba

University of Glasgow

SNH
Scottish Natural Heritage
Department for the Environment, Food and Rural Affairs

crew
Scotland's centre of expertise for waters

SEPA
Scottish Environment Protection Agency

Ordnance Survey

marine scotland

Adaptation Scotland
Scotland's Centre for Resilience and Adaptation

SCAPE
Scotland Coastal Architecture and the Problem of Erosion

Fife Coastal Council

HISTORIC SCOTLAND
ALBA AOSMHOIR

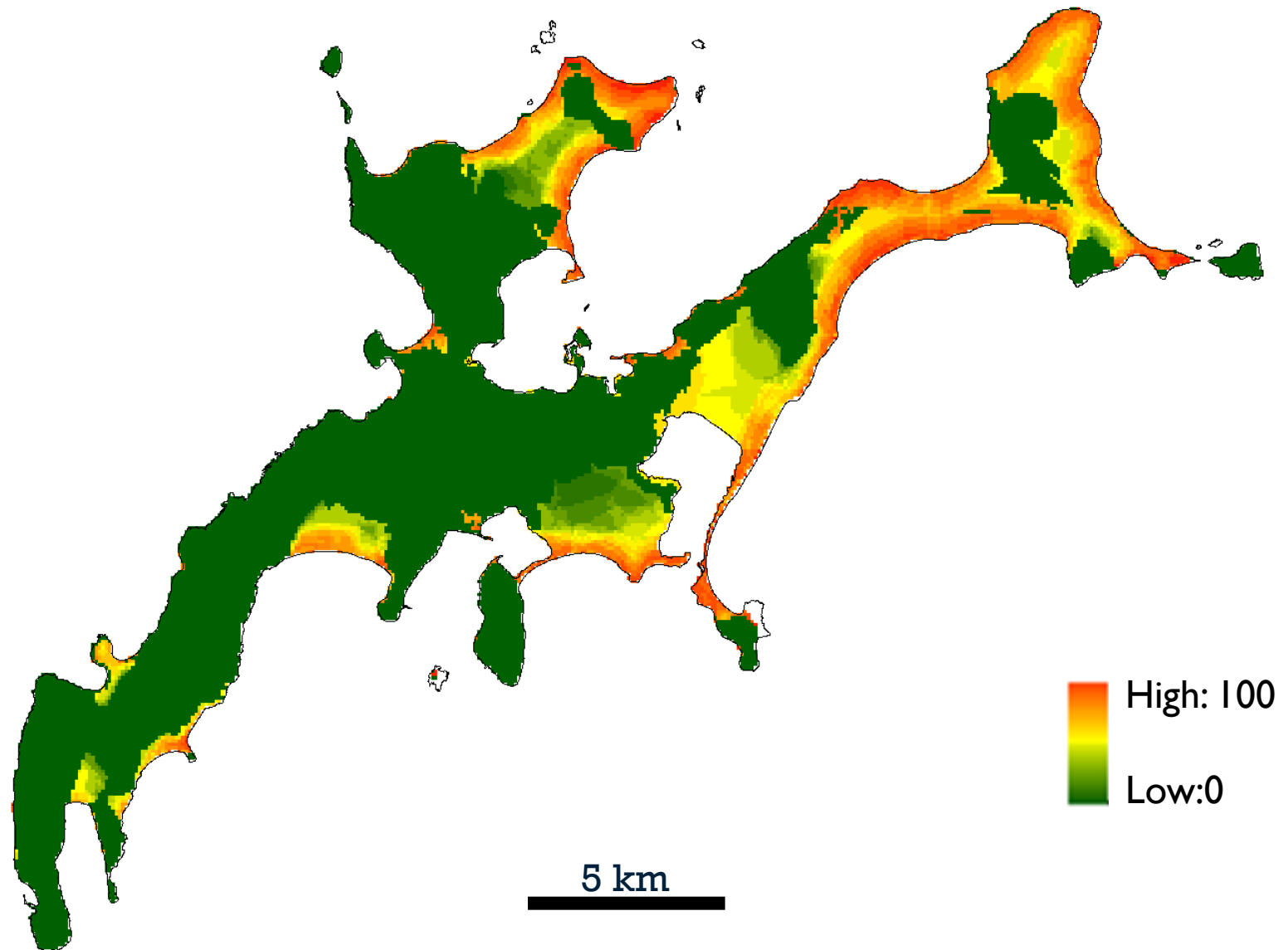
The future coast?

Future coast: 25 years (i.e. 25 x past rate)



Future coast will be amended by CESM.

Coastal Erosion Susceptibility Model (CESM)



Conclusions

- The NCCA is a pan-government project which has **classified Scotland's erodible coast for the first time**. The project is due to finish in September 2016.
- It will **inform statutory advice across Agencies and Local Authorities** alike in support of their strategic planning individually, but also collaboratively, thereby supporting the SG Climate Change Adaptation Programme.
- It will inform areas **where erosion may influence flood risk** – currently not identified within flood mapping.

Conclusions

- It has led to the first **checking & update of MHWS since the 1970s**, and ensured that the OS can and will maintain this in the future. The NCCA has led to the OS considering revisions to their coastal mapping methods across the whole of the UK.



www.dynamiccoast.com

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