

# Scotland Assesses the Impact of Future Coastal Change

Alistair Rennie, Jim Hansom, James Fitton & Lachlan Renwick



## Dynamic Coast

### Dynamic Coast Researchers:

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**SNH:** Lachlan Renwick, Rich Betts & Gabor Barton

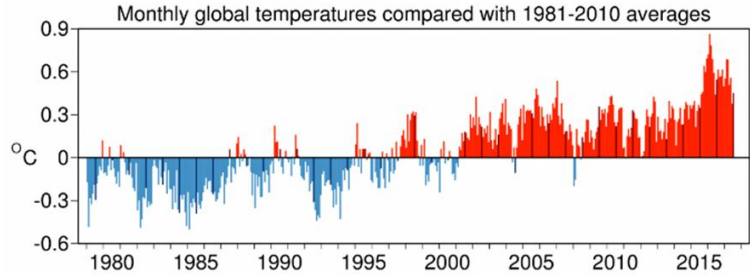
### Steering Committee:

### Funder:

Crew



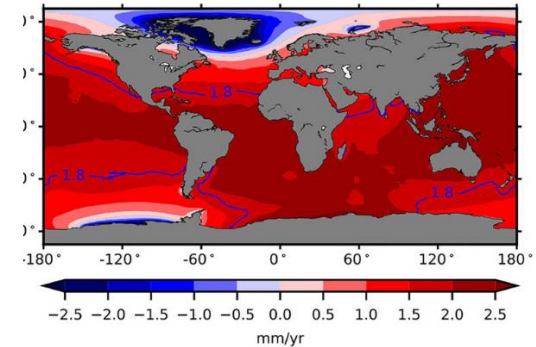
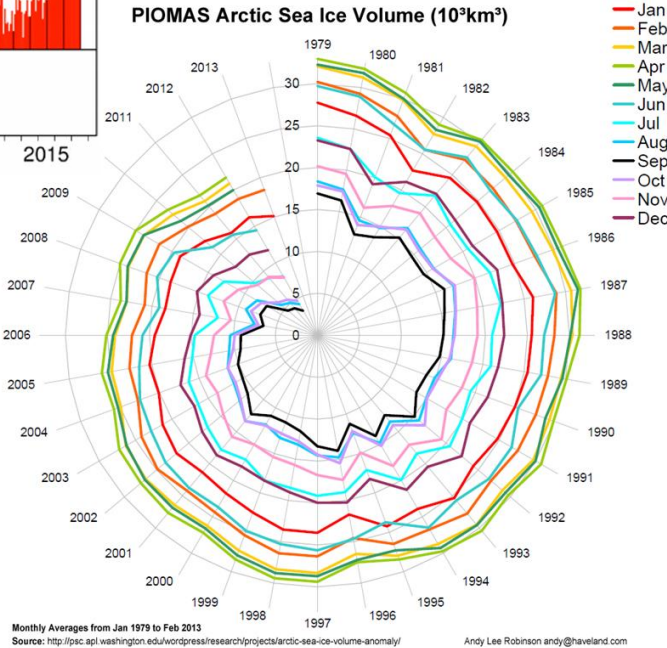
## Our climate is changing... Air temperature, sea ice volume, sea level



Global air temp (1981-2010)

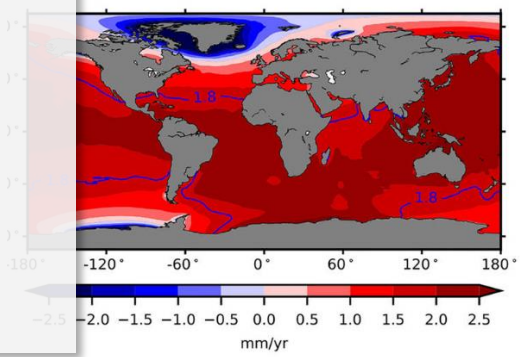
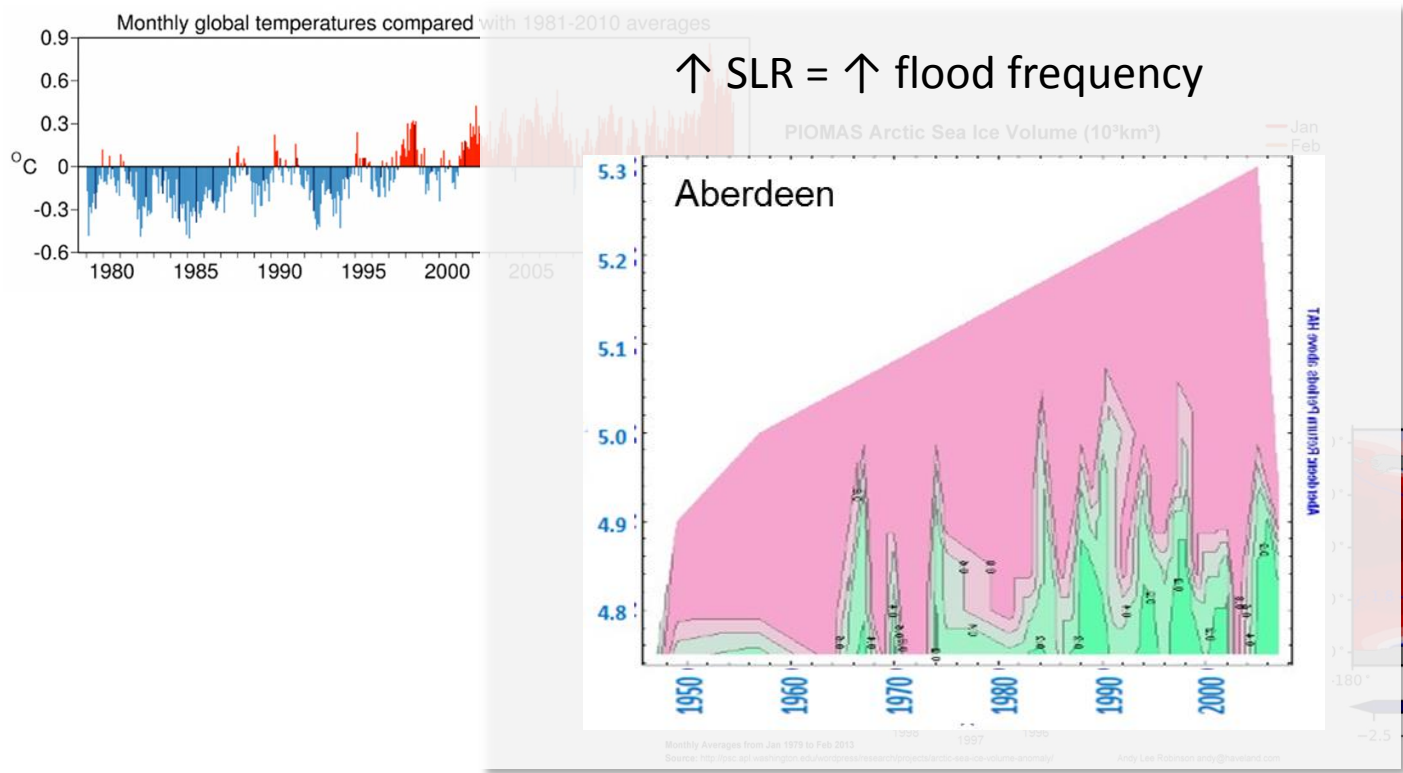
Arctic Sea Ice (1979-2012)

Global MLSΔ (2002-2014)



Sea level fingerprints (patterns of variation in sea level rise) calculated from GRACE satellite observations, 2002-2014. The blue contour (1.8 millimeters per year) shows the average sea level rise if all the water added to the ocean were spread uniformly around Earth.  
 Credits: NASA/UCI

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... but the consequences for erosion in Scotland are unknown.

Assets, Infrastructure, businesses & society



Skara Brae WHS (Orkney)



Golspie (Highland) © Northern Times



Saltcoasts (Ayrshire) © BBC

## Clear mitigation & adaptation duties across the public sector

Climate Change (Scotland) Act 2009 (asp 12)

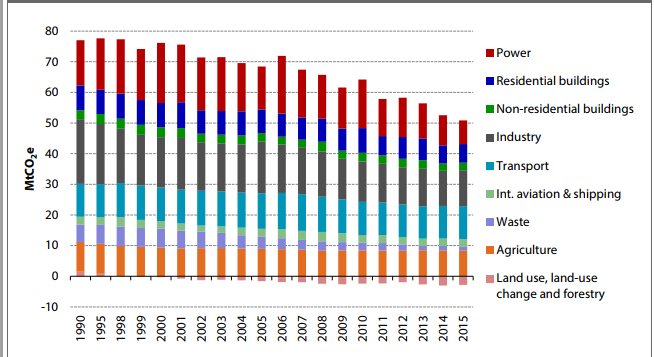


### Climate Change (Scotland) Act 2009 2009 asp 12

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	<i>The interim target</i>
2	The interim target
	<i>Annual targets</i>
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Figure 1.1. Scottish greenhouse gas emissions (1990-2015)



Source: NAEI (2017) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2015.


### Mitigation:

GHG emissions

1990-2015 38% ↓

### Adaptation:


Public sector duties

  
 UK Climate Change Risk Assessment  
 (Defra project code GA0204)


A climate change risk assessment for Scotland

January 2012

Contractors:  
 HR Wallingford  
 AMEC Environment & Infrastructure UK Ltd (formerly Entec UK Ltd)  
 The Met Office  
 Collingwood Environmental Planning  
 Alexander Baird Ltd  
 Paul Wallis Associates  
 Metreconomia




Climate Ready Scotland: Scottish Climate Change Adaptation Programme



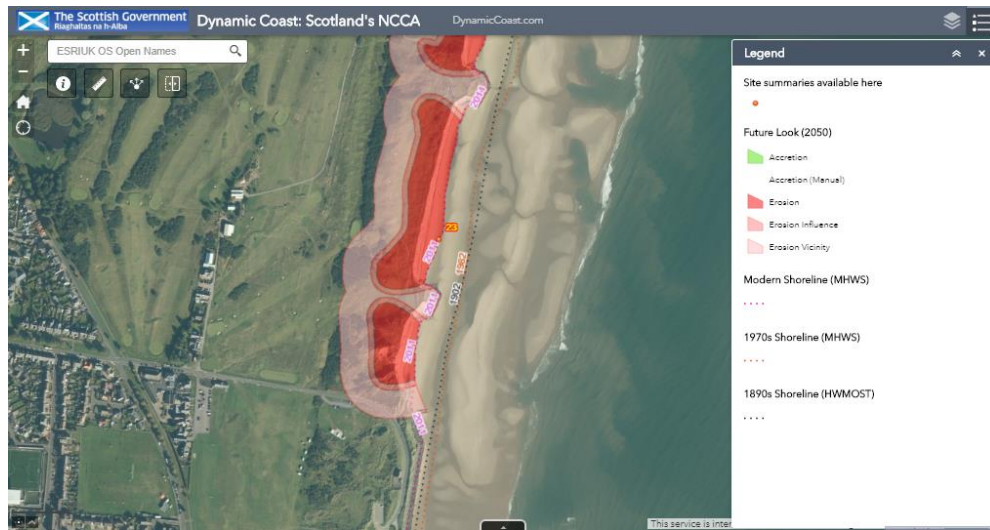
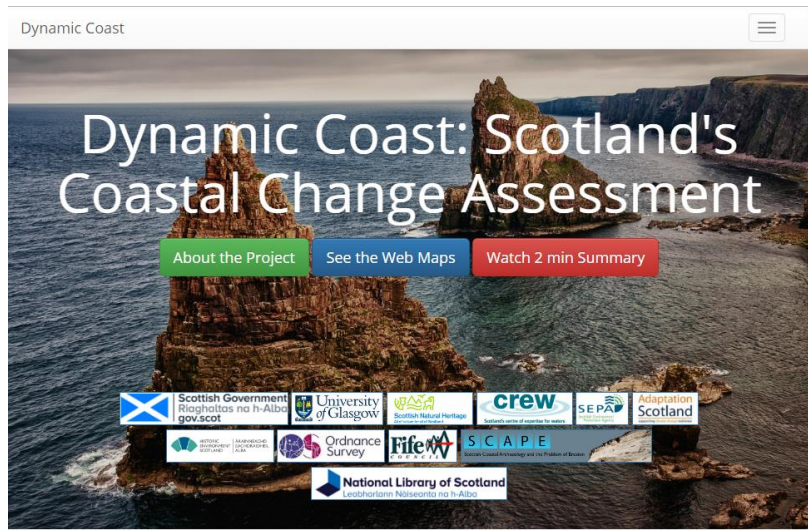
Laid before the Scottish Parliament under Section 53 of the Climate Change (Scotland) Act 2009

May 2014  
5/2014/63



## Dynamic Coast provides the evidence base

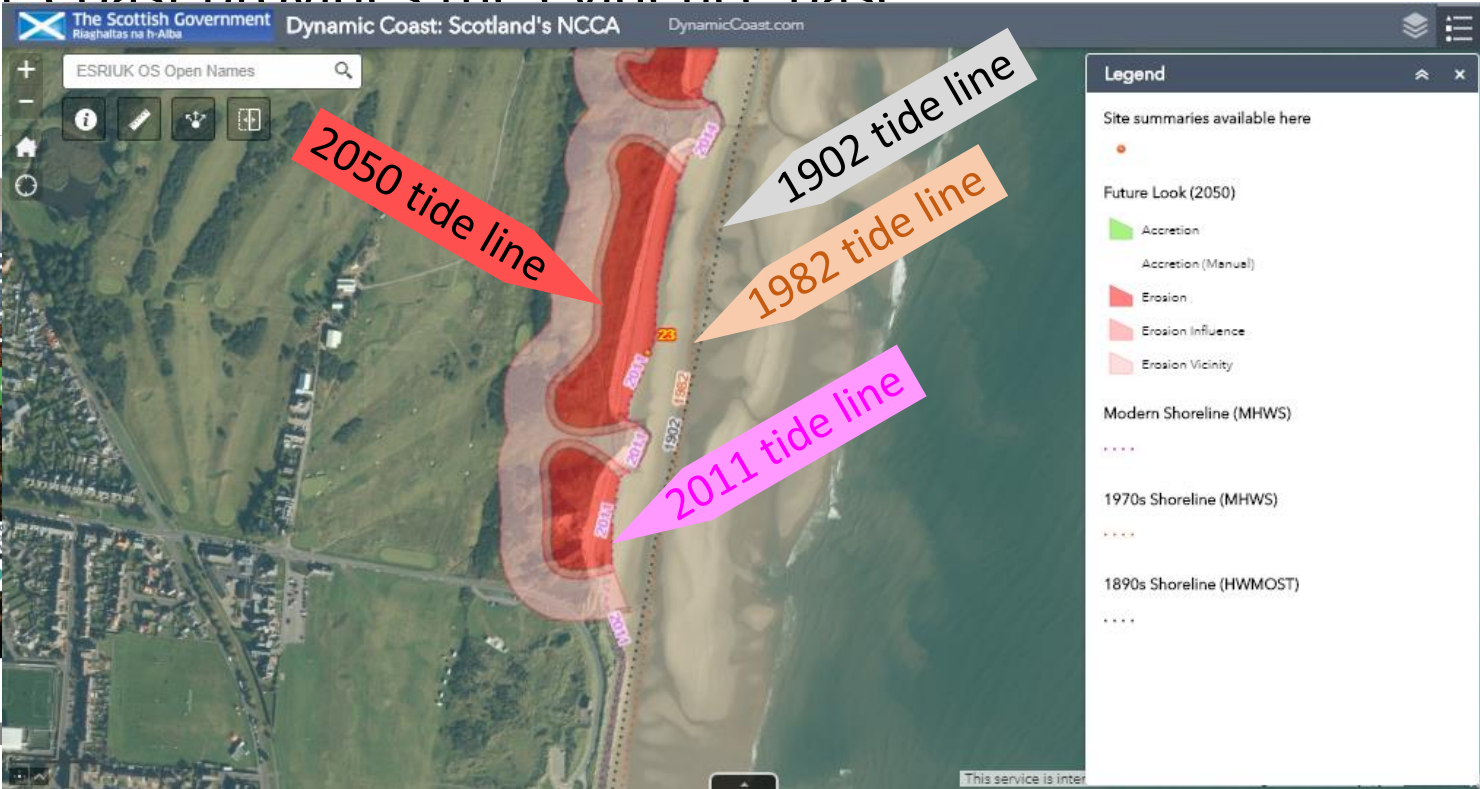
To appreciate past change, and use it to plan and become more resilient to climate change



We now know, where and what to concentrate on...

## Dynamic Coast provides the evidence base

To appreciate



change

We now know



## What have we done?

- Geo-rectified historical maps
- Semi-automated extraction of tide lines
- 1 million points on the 3 shorelines
- Semi-automated calculation of distance between points
- Analysis of change
- Future projection where change is real
- Vulnerability Assessment (what is at risk)
- Whole Coast Assessment (what is elsewhere)
- Publish results online via AGOL, website & reports



## Results

### Maps:

- 3 x 3,900km mapping
- Change analysis, future coast, vuln. assessment,

### Reports:

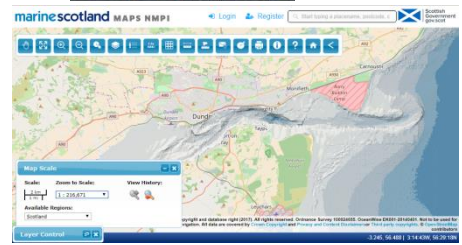
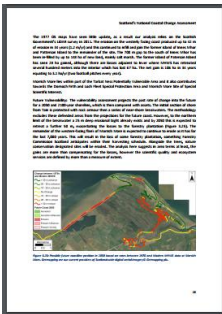
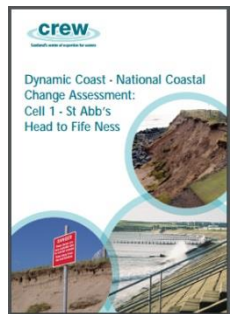
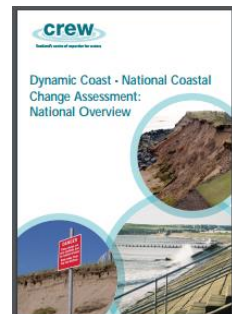
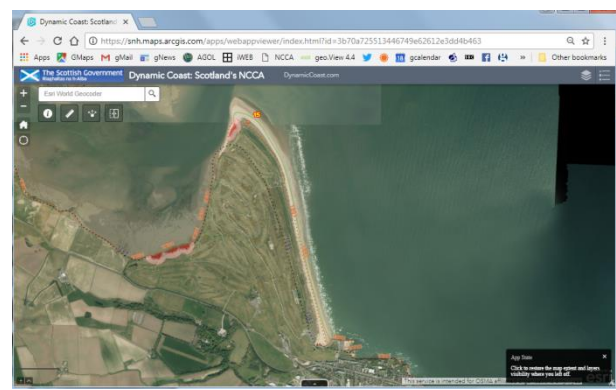
- 20 reports incl. National overview and Site Summaries

### Video:

- Summaries and tutorials

### Data supply

- Mainstreaming the results



## Scotland's soft coast is responding to climate change

### Nature protects lots of assets and people:

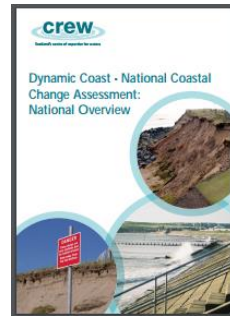
- £13bn assets protected by natural defences,  
Of these £340m at risk by 2050 (likely underestimate)
- £5bn assets protected by engineered defences

**Switch to erosion already occurred.** This is an issue for today not tomorrow!

- accretion down 22%, erosion up 39%, erosion rate doubles, since 1970s
- erosional bias on our east coast (where more assets are)

### Detailed **Mitigation and Adaptation** planning now essential

- Valuing contribution of natural defences integrated alongside hard engineering
- Results endorsed by Roseanna Cunningham (Cab Sec)



## The method isn't.... the broader approach is a game-changer

Enables the **team to work together** (irrespective of GIS-abilities)



Policy & Science Experts

(GIS Ability)

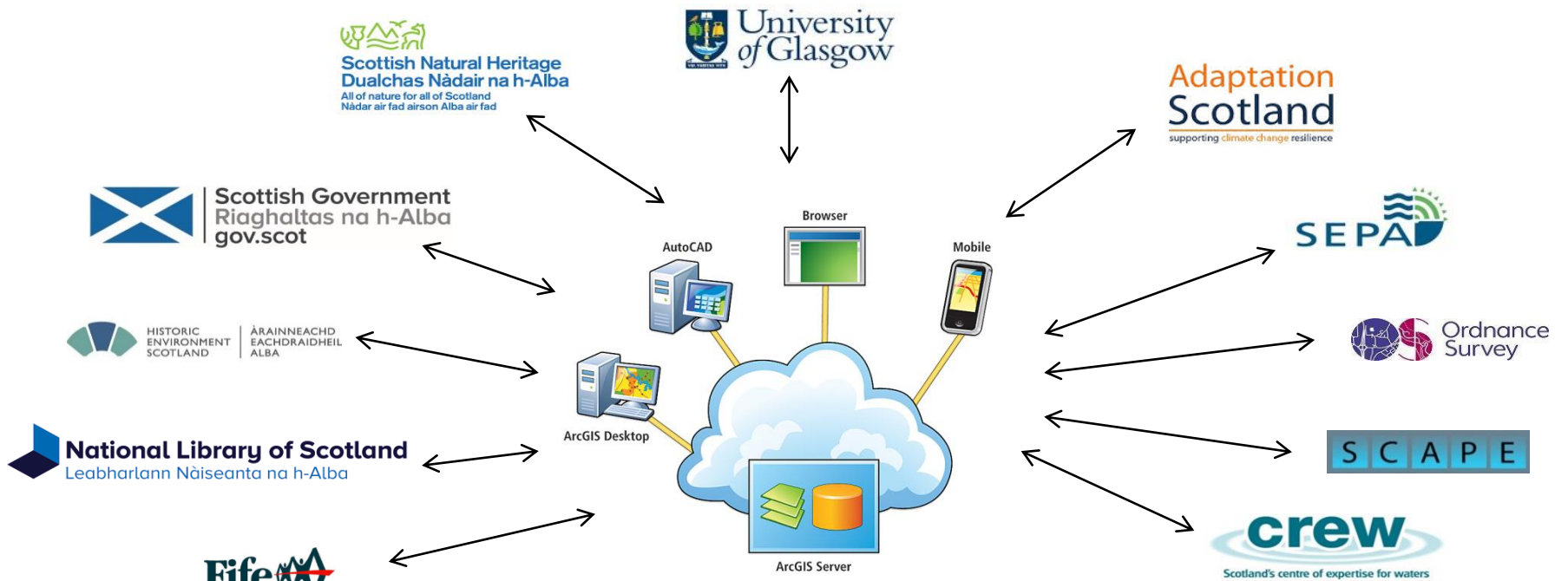
GIS-Jedi

**Democratises the analysis** – the public can understand  
Data speaks loudly, to many and can be updated quickly



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Level 1 users - helped

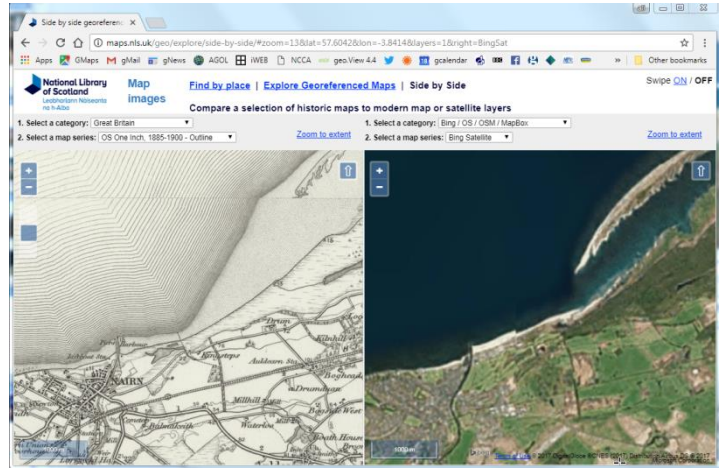
[www.DynamicCoast.com](http://www.DynamicCoast.com)

## Enriching the evidence & user experience

### Evidence:

Improved analysis on more varied data

(vege edge, MLWS, DTMs, climate change)... ArcCollector

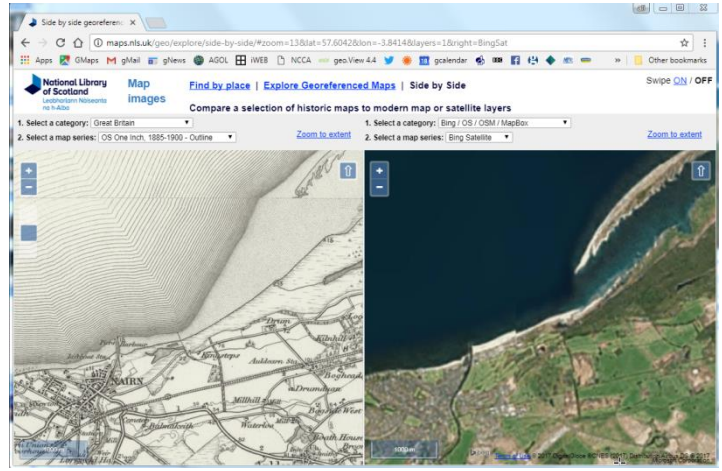
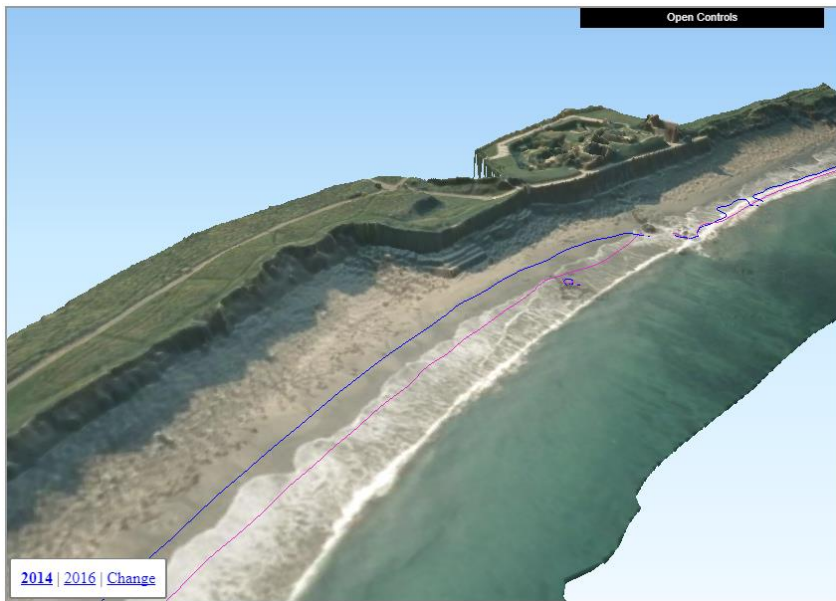


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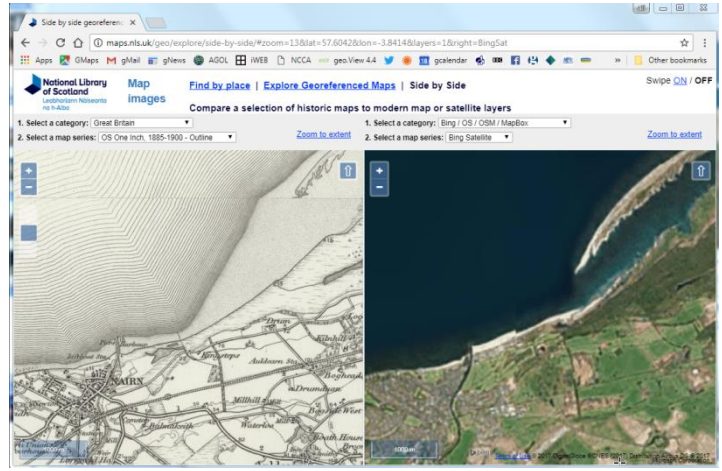


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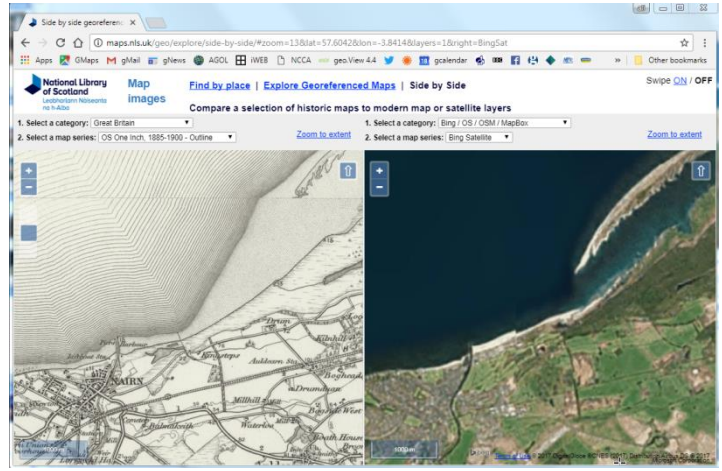
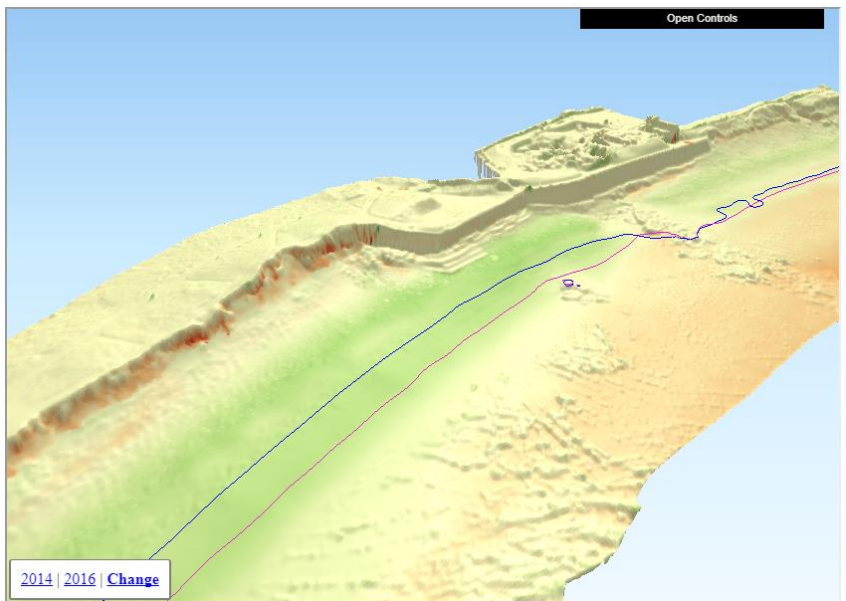


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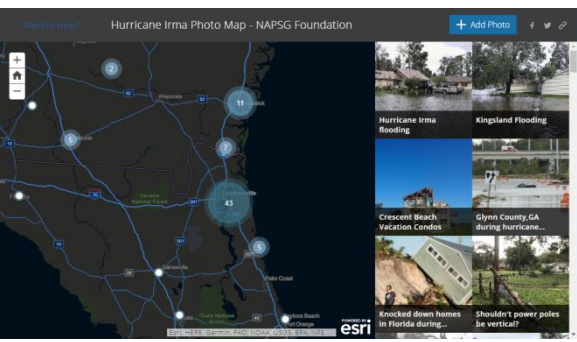
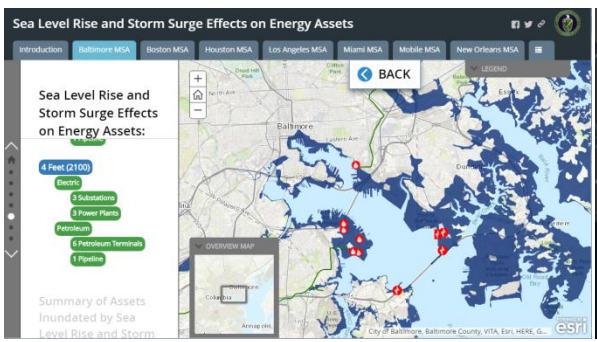
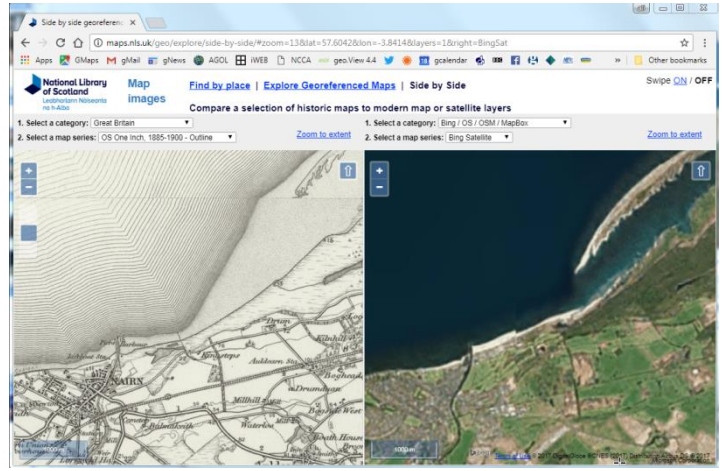
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### User Experience:

More layers (NLS historic maps, aerials, 3D change data?)

Story Maps ([click](#)) ... Bespoke maps for different users?



## The timing, questions, data and tools are right.

We have been able to do more targeted, robust, informative analysis... more quickly and share more powerfully to more people.

Arguably with climate change already effecting flooding and erosion, the need has never been greater to inform mitigation and adaptation planning on our vulnerable shorelines, to ensure Scotland's assets, infrastructure and communities remain resilient.

That is what was asked of us and what we have delivered  
... now it has to be implemented!





For more information please visit:

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