

# Historic Environment Scotland's Collaborative Approach To Climate Change Impacts, Risk And Adaptation

---

Dr Mairi H Davies

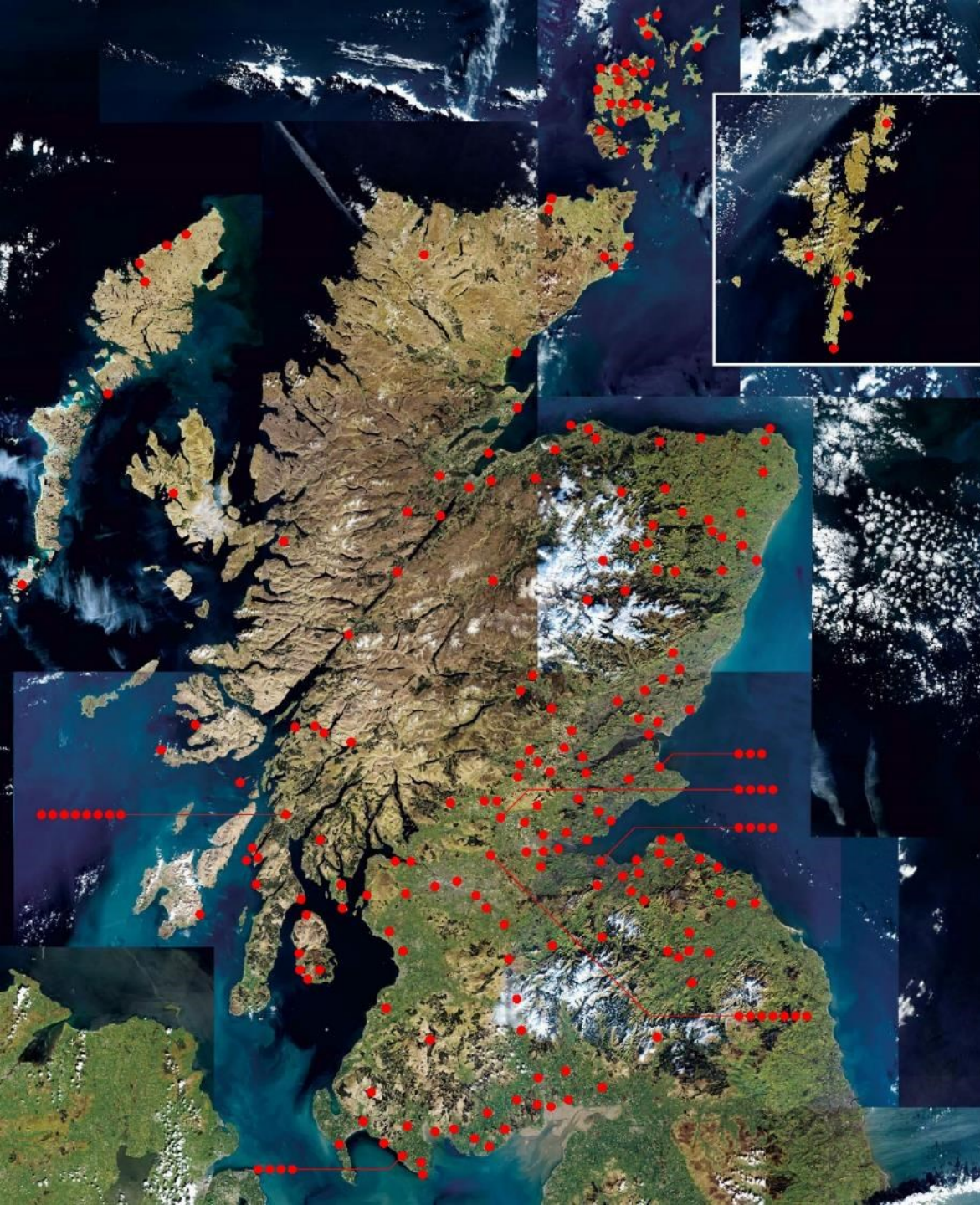


We are a charity dedicated to  
the advancement  
of heritage, culture,  
education and environmental  
protection.



HISTORIC  
ENVIRONMENT  
SCOTLAND

ÀRAINNEACHD  
EACHDRAIDHEIL  
ALBA



We are the lead public body for Scotland's historic environment.

Our mission is to **protect, conserve and manage** the historic environment

We have in our direct care 336 historic sites – from stone circles to mediaeval castles



HISTORIC  
ENVIRONMENT  
SCOTLAND

ÀRAINNEACHD  
EACHDRAIDHEIL  
ALBA

# 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT



Adopted by all UN Members States at the UN Sustainable Development Summit, September 2015

# NATIONAL PERFORMANCE FRAMEWORK

## National Outcome

### National Indicators

- Visits to the outdoors
- State of historic sites
- Condition of protected nature sites
- Energy from renewable sources
- Waste generated
- Sustainability of fish stocks
- Biodiversity
- Marine environment

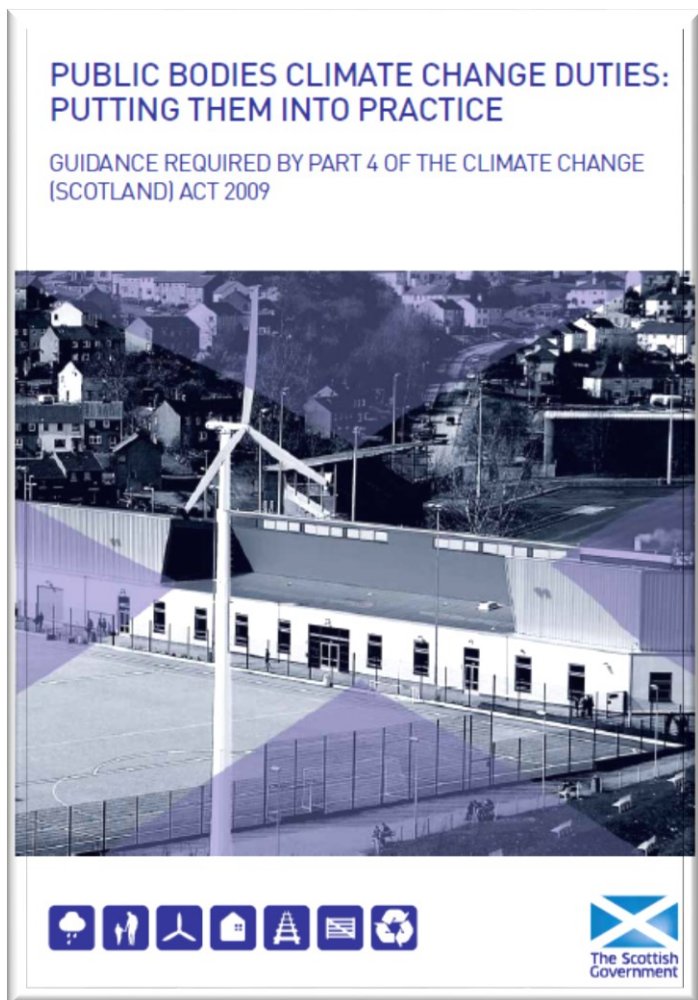
### Sustainable Development Goals

- Gender equality
- Affordable and clean energy
- Decent work and economic growth
- Industry, innovation and infrastructure
- Responsible consumption and production
- Clean water and sanitation
- Climate action
- Life below water
- Life on land



# OUR OBLIGATIONS

## PUBLIC BODY DUTIES



HES is charged with tackling Climate Change under the following themes:



Climate Change (Scotland) Act 2009  
2009 asp 12

### MITIGATION

Contribute to emissions reduction targets directly, and indirectly through wider functions.

### ADAPTATION

Deliver programmes for (preparedness) by planning to continue function and increase resilience. Consider impacts of current decisions/ investments over future decades.

### SUSTAINABILITY

Consider social, economic and environmental impact of all activities, policy decisions and strategy.



**UK  
2017** | Climate  
Change  
Risk  
Assessment

## UK Climate Change Risk Assessment 2017

Synthesis report: priorities for the next five years



## 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

14/0014/03



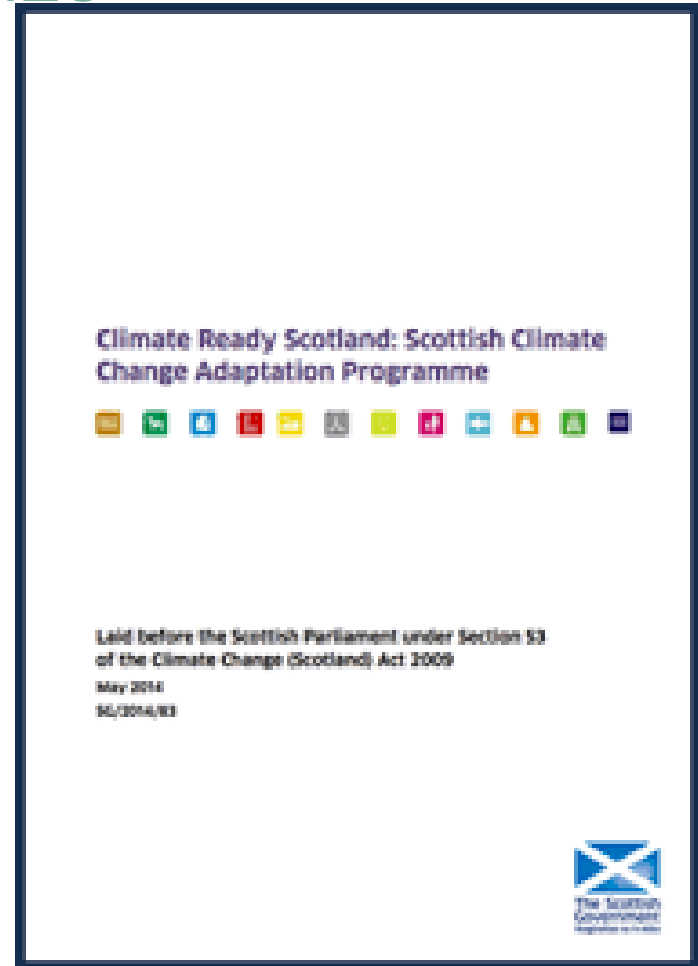
# CLIMATE READY SCOTLAND

## OBJECTIVES ASSIGNED TO HES

B1: Understand the effects of climate change impacts on buildings.

B2: Provide knowledge, skills & tools

B3: Increase resilience of buildings





# CLIMATE READY SCOTLAND

## POLICY

B1-2: Research to identify resilience measures:

- Energy efficiency/thermal performance;
- Physical impact of changing weather patterns;
- GIS quantification of heritage assets;
- Collate action on coastal erosion and flooding.

B2-4: Implement HS Climate Change Action Plan

B2-5: Joint Agency programme

# CLIMATE READY SCOTLAND

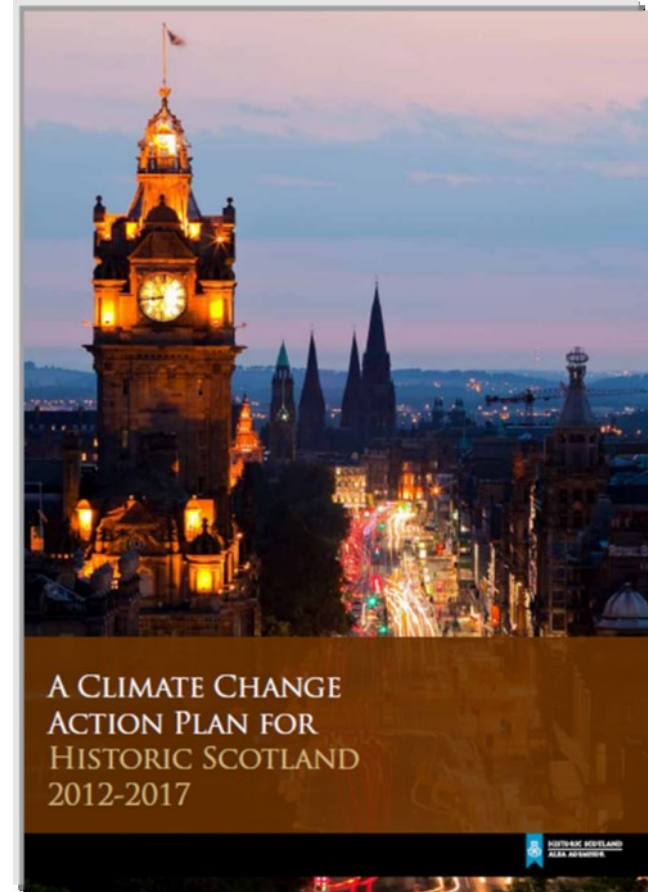
## DELIVERABLES

- Develop methodology for assessing climate change risk to heritage sites;
- Creation of Climate Change Risk Register for HS Estate & incorporation into internal planning and resource allocation;
- Publication of guidance and dissemination of advice.

# CLIMATE CHANGE ACTION PLAN

2012-2017

- Reducing energy use in our buildings
- Improving our operations
- Improving energy efficiency in traditional buildings
- **Building resilience: preparing the historic environment for climate change**
- Improving sustainability
- Developing and promoting sustainable tourism
- Informing and influencing others



# OUR OBLIGATIONS

## PUBLIC BODY DUTIES

# FOR ALL OUR FUTURES

CORPORATE PLAN 2016-19

**1 LEAD**

**2 UNDERSTAND**

**3 PROTECT**

**4 VALUE**

**5 PERFORM**

- KPI 3: Manage the impact of climate change by improving knowledge and understanding.
- KPI 9: We are an efficient, resilient and sustainable organisation.

# 5 STRATEGIC THEMES

**Our five strategic themes provide the framework for our strategic outcomes, our objectives, our activities and our performance measures.**

## **I. LEAD**

We will work to address the impact of climate change by leading the way in the adaptation of the historic environment to climate change, contributing to national targets and increasing resilience against the physical impacts of climate change.

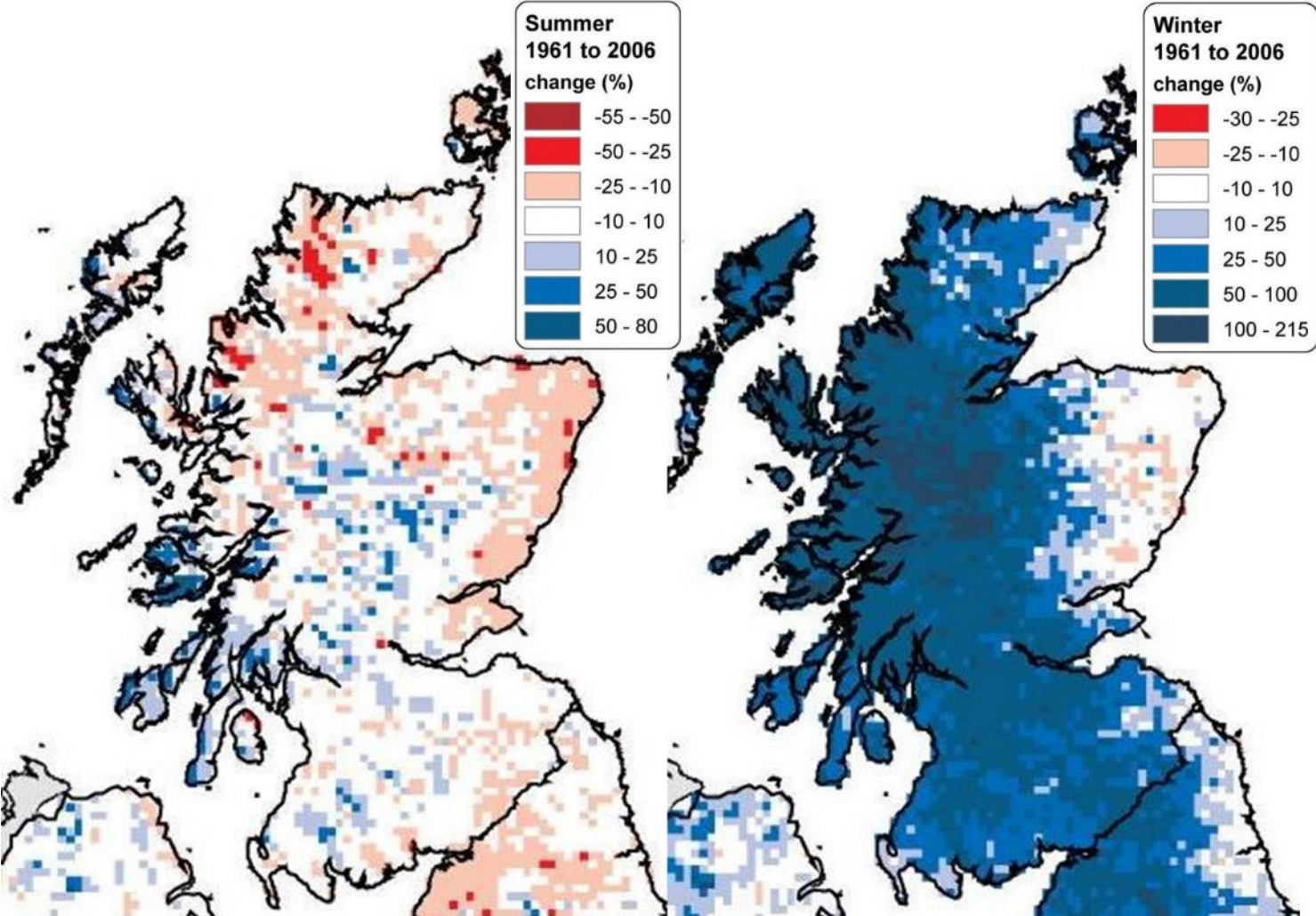
**KPI 3** “Managed the impact of climate change by improving knowledge and understanding.”

## **5. PERFORM**

We will address the impact of our activities on climate change

**KPI9:** “We are an efficient, resilient and sustainable organisation

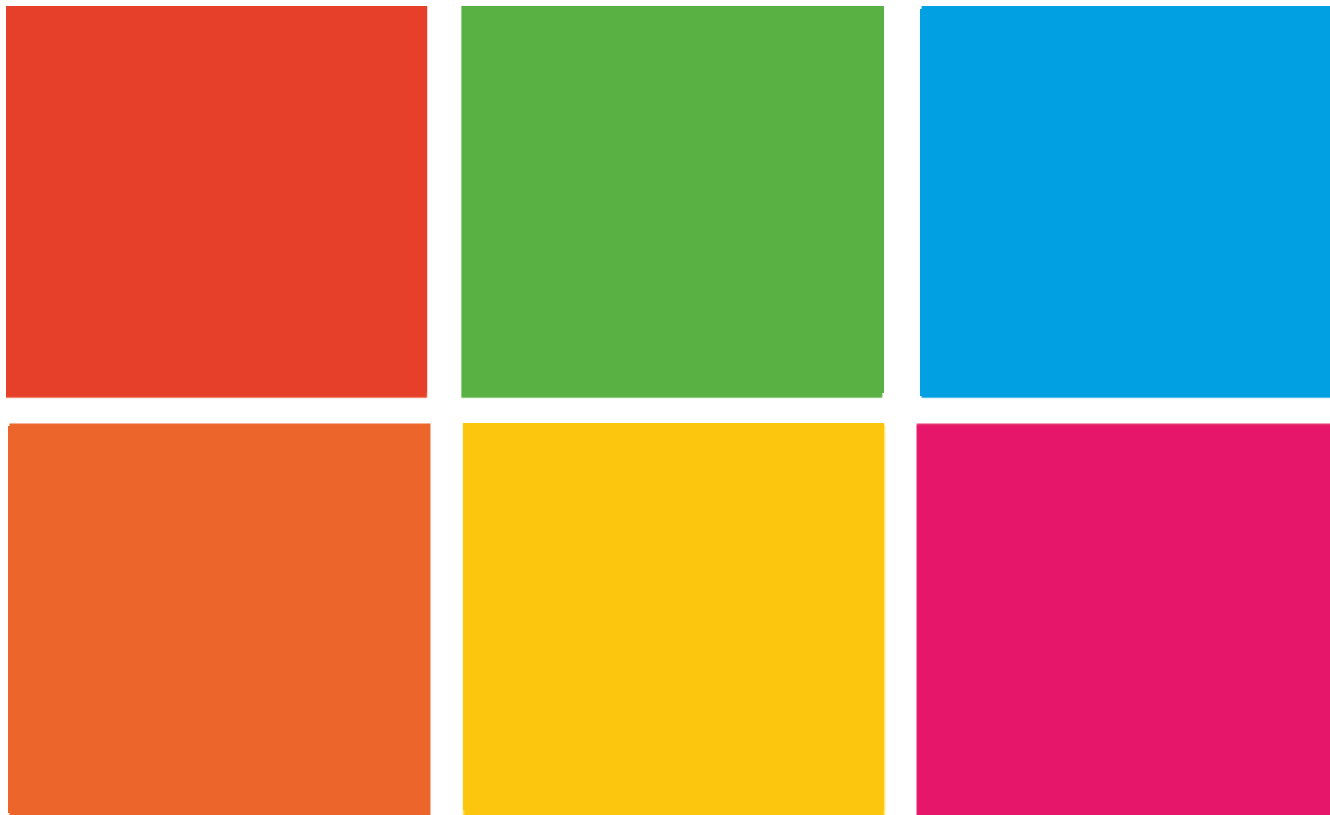
# OBSERVED TREND: CHANGE IN AVERAGE TOTAL PRECIPITATION 1961-2006



# CLIMATE CHANGE IN SCOTLAND

## ALREADY OBSERVED

Since the 1960's, there has been a measurable change in the climate of Scotland.



Source: Scotland's Climate Trends Handbook (Sniffer, 2014).

# CLIMATE CHANGE IN SCOTLAND

## CHANGE ANTICIPATED

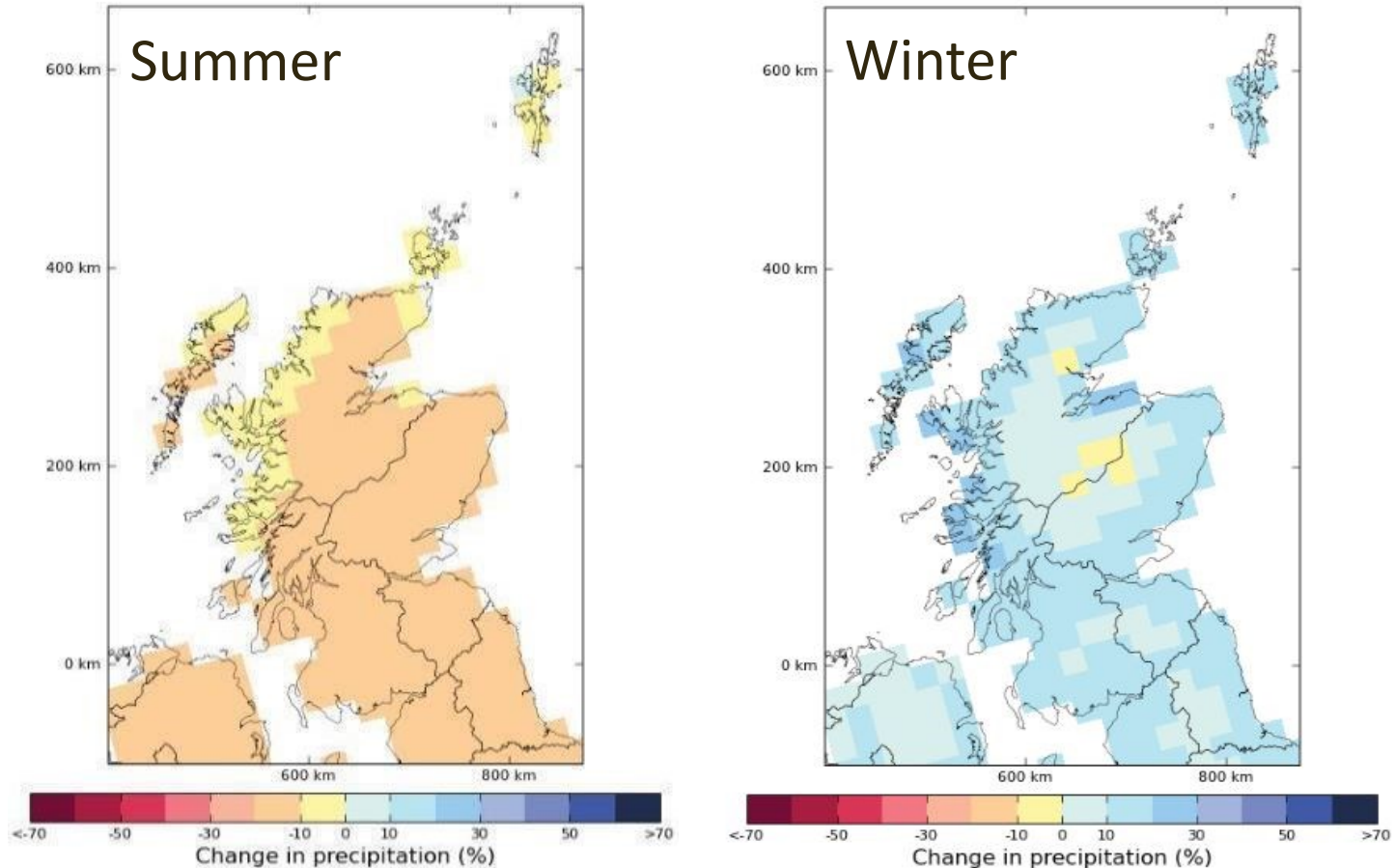
Anticipated change  
by the 2050's  
(Source: UKCP09)



Maeshowe Neolithic burial chamber, Orkney World Heritage Site



# CLIMATE PROJECTIONS



Expected change in precipitation by the 2050s

(Source: UKCP09)

# RISK ASSESSMENT

The 336 Properties in Care of HES are on the front-line of our changing climate:

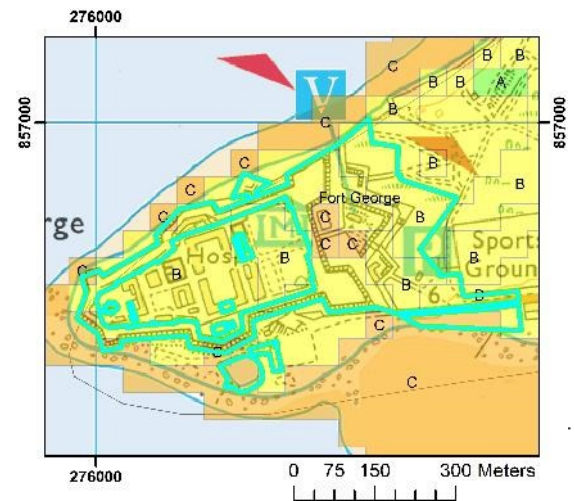
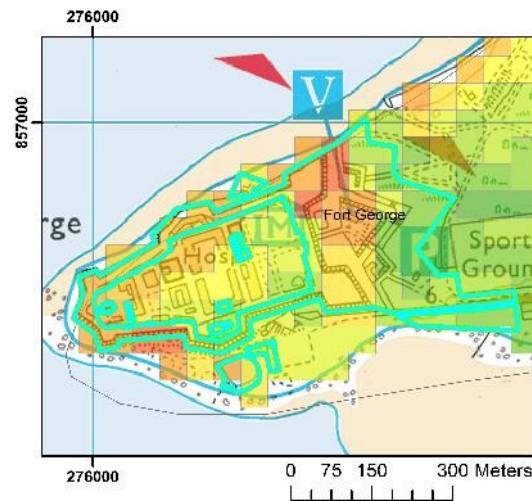
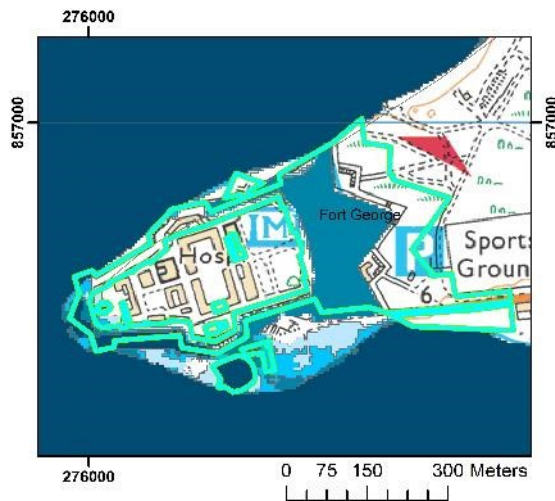
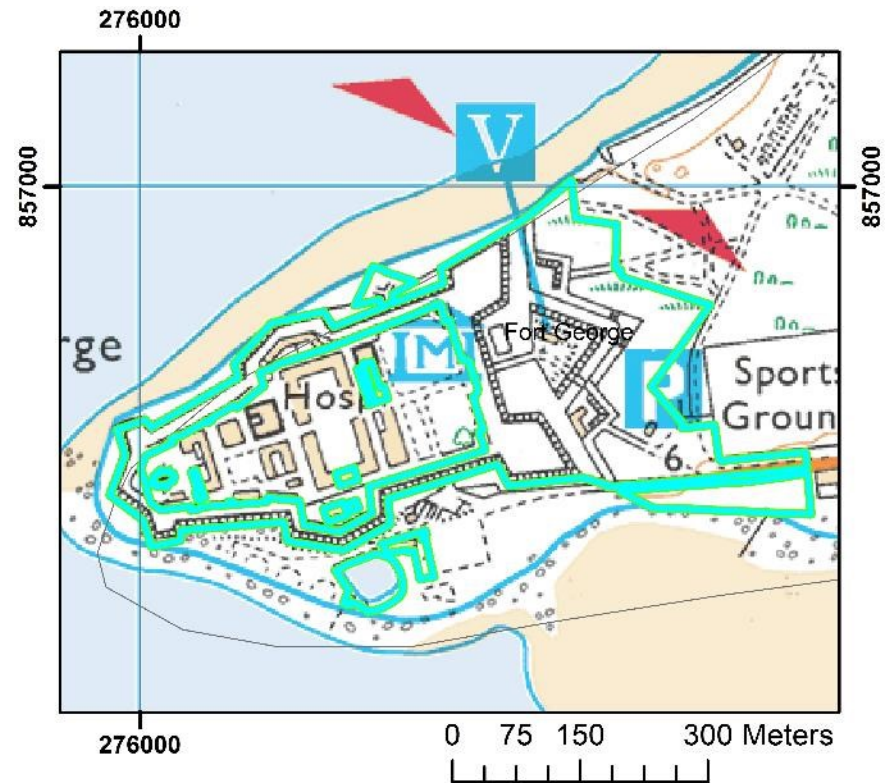
- Many are situated in some of the most susceptible areas to natural hazards.
- This project is an assessment of natural hazard risk at HES's sites.
- GIS based study, pulling together data from **SEPA** and the **BGS**.
- Looking at natural hazard risk from **Coastal Erosion, Ground Instability** and **Flooding** (Fluvial, Pluvial, Coastal and Groundwater).

As climate change intensifies, increased occurrence rates of natural hazard events should be expected.



# LIKELIHOOD

- Begins with spatial analysis by overlaying hazard maps with site boundary data.
- Running queries in GIS then generates a hazard profile for each site.
- Likelihood score of 1 to 5 assigned to each property, for each hazard with 5 being the 'most likely', 1 the 'least likely'.



# IMPACT

Assigning an **impact score** – based on the ‘type’ of property in question.



34% CATEGORIES A&B

ROOFED MONUMENTS



33% CATEGORIES C

UN-ROOFED MONUMENTS WITH HIGH MASONRY



33% CATEGORIES D, E & F

LOW MASONRY MONUMENTS / STANDING / CARVED STONES AND FIELD MONUMENTS

# CALCULATING RISK

Risk = Impact X Likelihood

<b>Impact</b>	<b>5</b>	5	10	15	20	25
	<b>4</b>	4	8	12	16	20
	<b>3</b>	3	6	9	12	15
	<b>2</b>	2	4	6	8	10
	<b>1</b>	1	2	3	4	5
<b>Multiplier</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
		<b>Likelihood</b>				

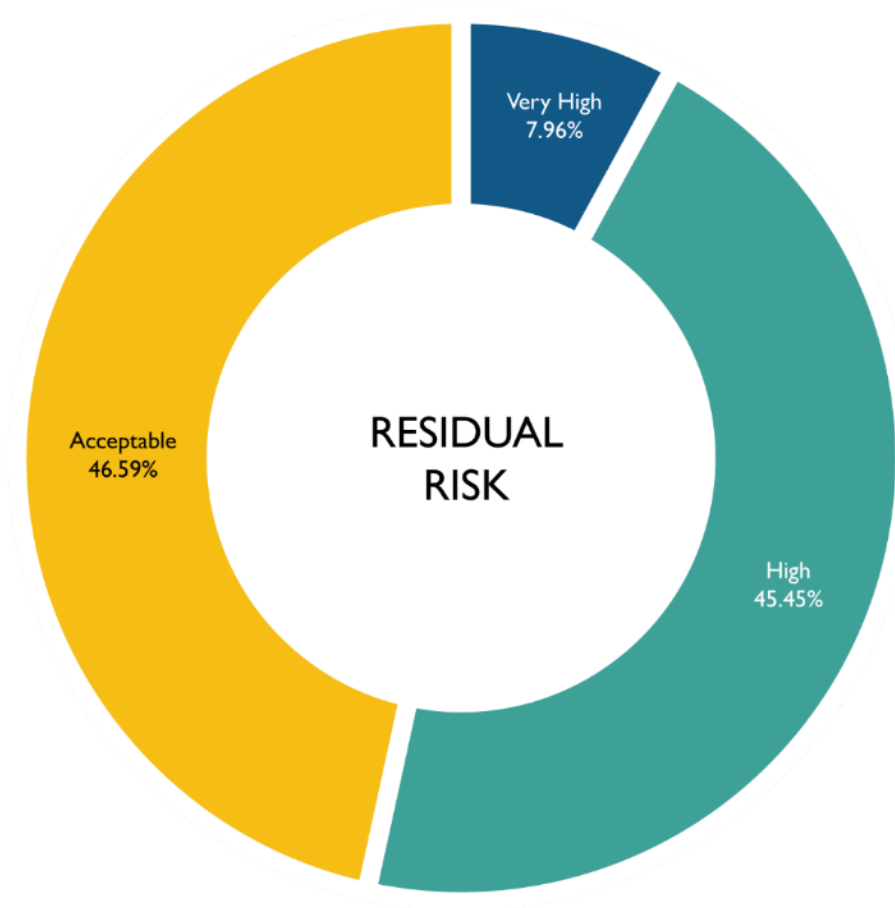
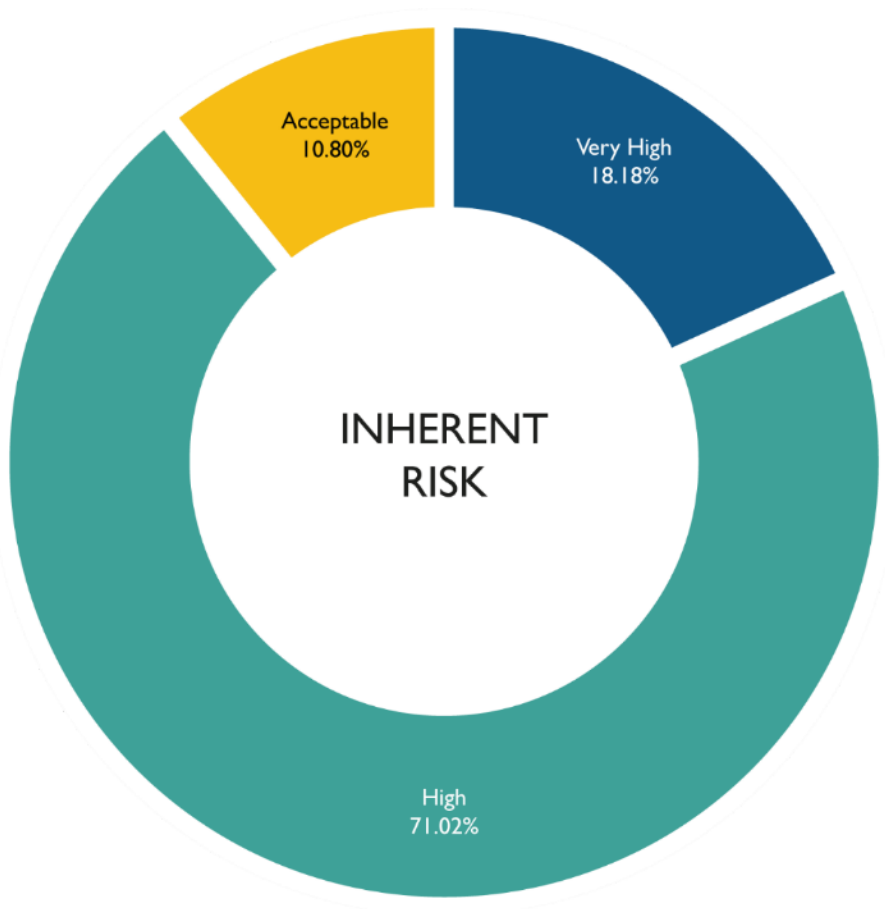
Table 1: The Risk Matrix. Multiplying the 'likelihood' by the 'impact' generates a risk score. The following description can be added to the 'likelihood' score: (1) do not believe will ever happen; (2) do not expect to happen; (3) may occur occasionally; (4) will probably occur; (5) likely to occur. See Appendix A for further information on 'impact' scores.

Risk Level	Score	Risk Level Description
Very High	4	Unacceptable level of risk exposure that requires immediate mitigating action. Action at SMT.
High	3	Unacceptable level of risk which requires controls to be put in place to reduce exposure. Action in Directorate / Consider SMT.
Medium	2	Acceptable level of risk subject to regular passive monitoring. Action in Directorate.
Low	1	Acceptable level of risk subject to regular passive monitoring. Action in Team.

Table 2: Further breakdown of 'risk ratings'. The level at which action should be discussed / taken is determined by how high the risk score is e.g. where a site records a 'very high' level of risk, action should be taken by the Senior Management Team (SMT).

# The Results

Out of the 352 'sites' investigated:



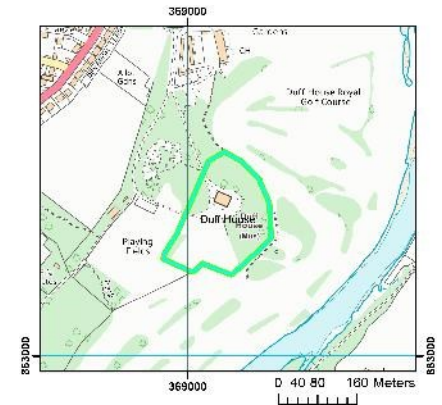
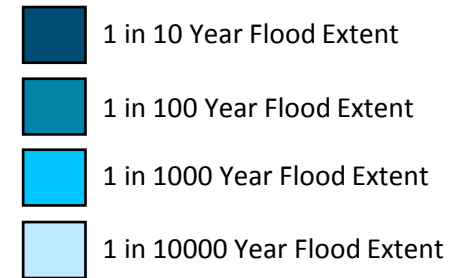
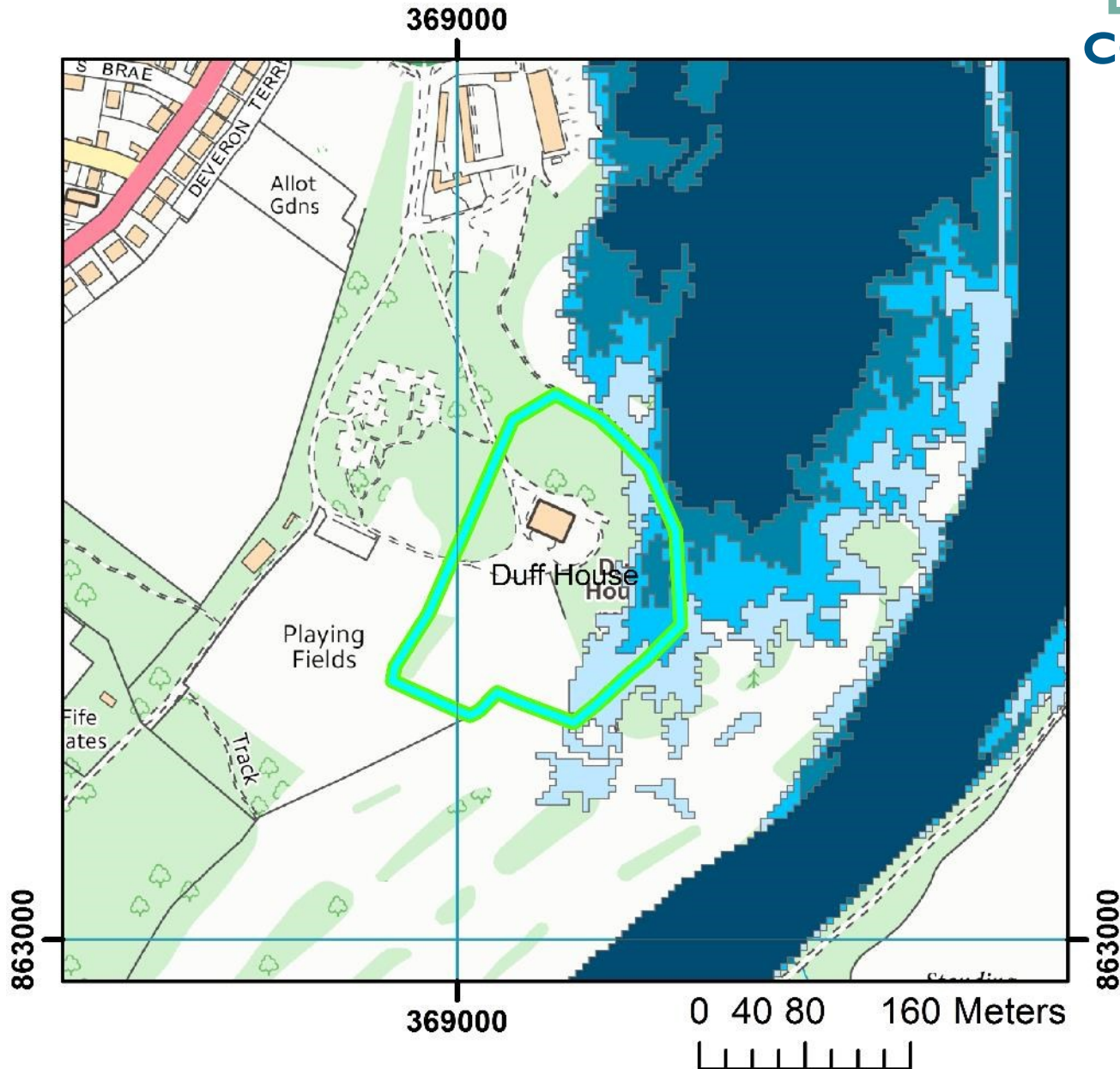
# DUFF HOUSE

Banff, Aberdeenshire



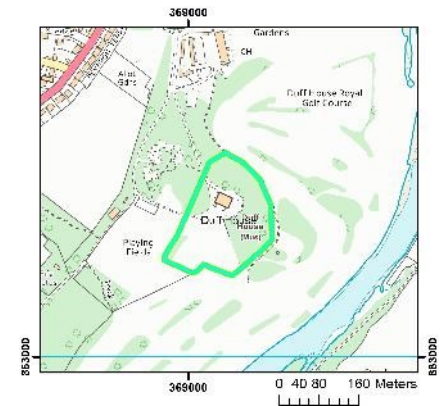
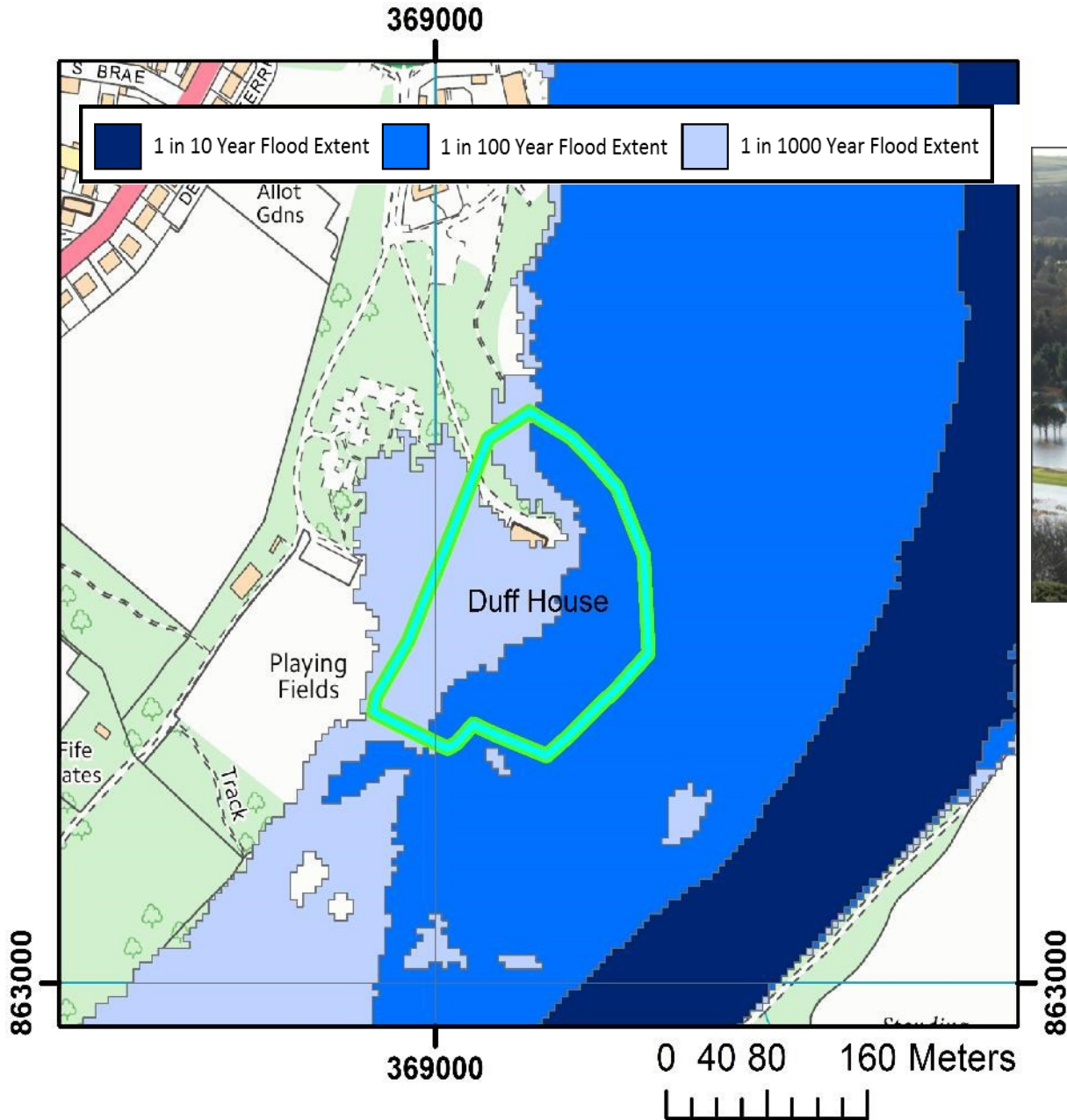
- Early Georgian mansion
- Architect: William Adam (1735)
- Family house, hotel, sanatorium, prisoner-of-war camp, visitor attraction
- Houses art collection from National Galleries Scotland

# DUFF HOUSE COASTAL FLOODING





# DUFF HOUSE FLUVIAL FLOODING



# COLLECTIONS

## SALVAGE PLANNING



- Climate Change Team contributed to the development of a new Salvage Plan for Duff House
- Our Risk Assessment helps identify specific threats meaning that we can better prepare for these scenarios.
- It flags up problems that we may not have been aware of previously.
- The mapping can also help us to determine any particular access problems we may have in an emergency (e.g. if roads leading to a site are also at risk that may have knock on effect on any incident response).
- **Allows us to assess whether our 'safe areas' are in fact safe.**
- We helped deliver Salvage Training, engaging with HES and our partners, including National Galleries Scotland, Scottish Fire and Rescue Service and our salvage contractor, raising awareness of Climate Change and related hazards.

# RELOCATION & MANAGED LOSS

- 3000 year old Meur burnt mound in Sanday, at risk of total destruction by coastal erosion.





# MEUR BURNT MOUND, SANDAY, ORKNEY



© SCAPE

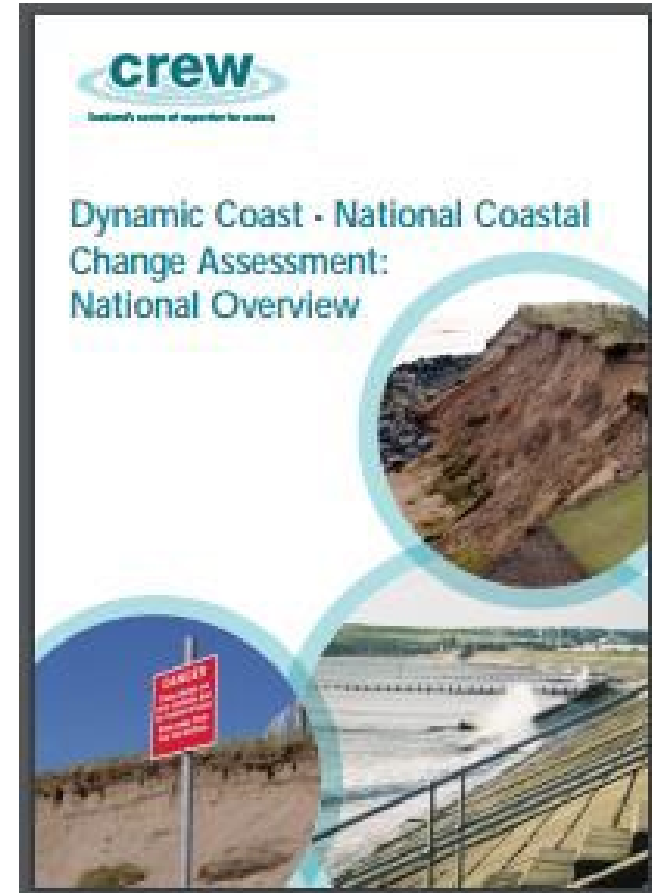
# WORKING IN PARTNERSHIP EDINBURGH ADAPTS



**Edinburgh Adapts**  
**Climate Change Adaptation Action Plan**  
2016 → 2020

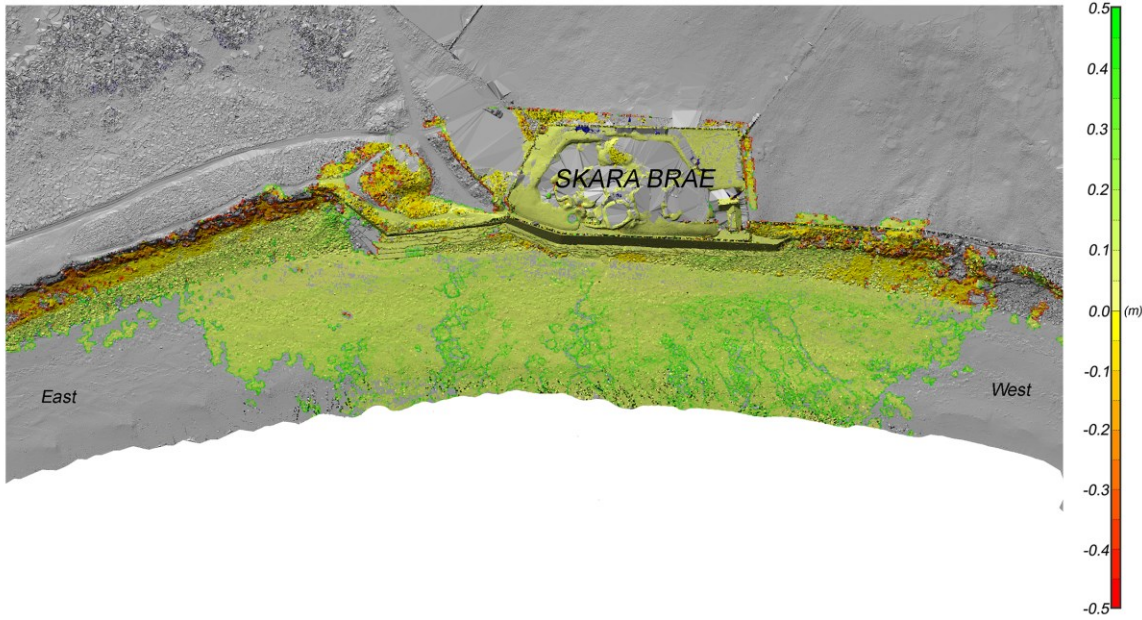


# DYNAMIC COAST NATIONAL COASTAL CHANGE ASSESSMENT

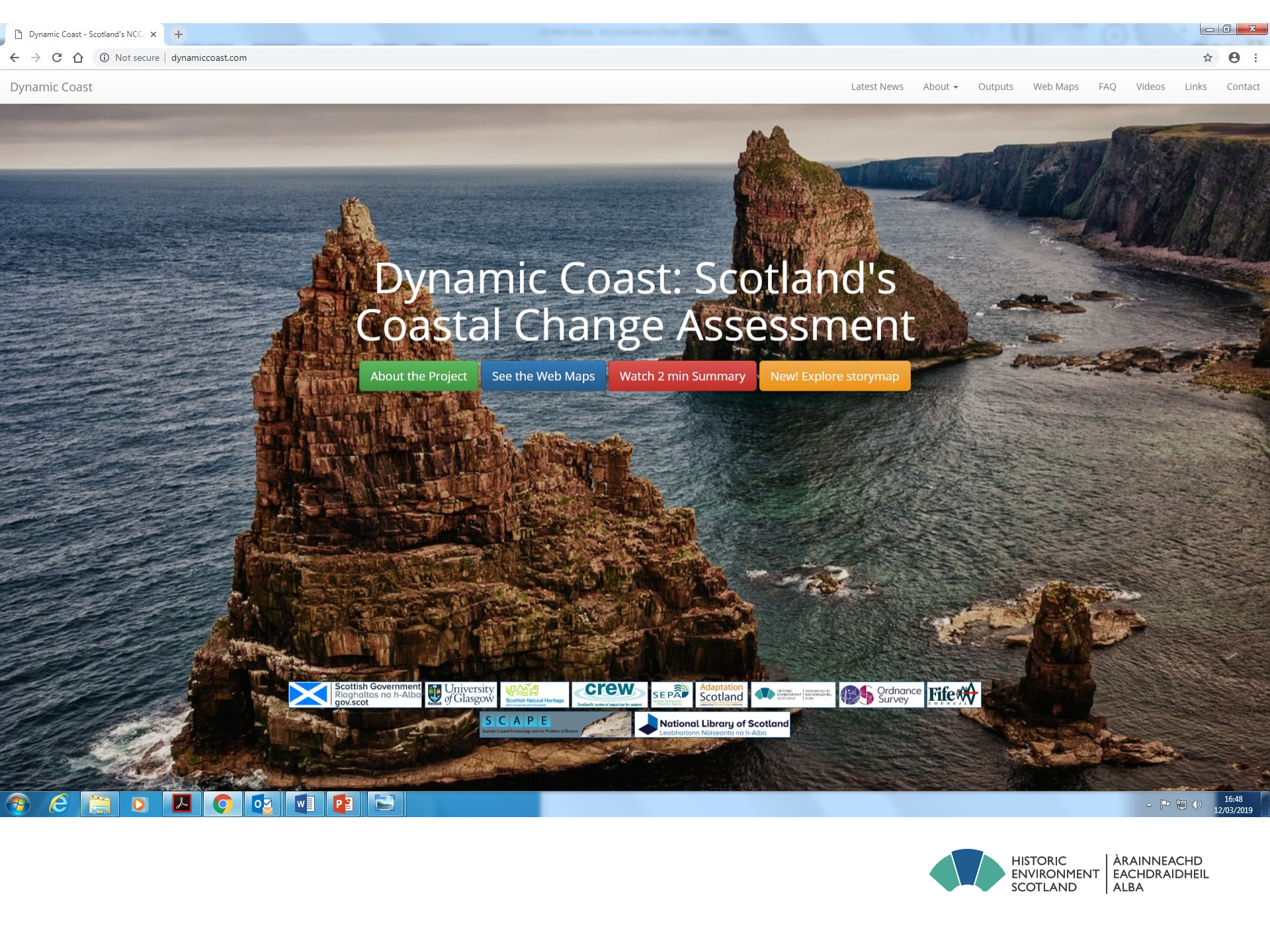


# SKARA BRAE









# Dynamic Coast: Scotland's Coastal Change Assessment

- About the Project
- See the Web Maps
- Watch 2 min Summary
- New! Explore storymap

Logos of partner organizations: Scottish Government, University of Glasgow, Scottish Natural Heritage, crew, SEPA, Adaptation Scotland, National Library of Scotland, SCAPE, Ordnance Survey, Rife.

## **FOR MORE INFORMATION CONTACT:**

**NAME: Dr Mairi Davies**

**E: [mairi.davies@hes.scot](mailto:mairi.davies@hes.scot)**

**T: +44 (0)131 668 8616**

**CLIMATE CHANGE TEAM: [climatechange@hes.scot](mailto:climatechange@hes.scot)  
<https://www.historicenvironment.scot/about-us/what-we-do/climate-change/>**

**BLOG:**

**<http://blog.historicenvironment.scot/category/climate-change/>**

**(please subscribe!)**

**TECHNICAL RESOURCES AND PUBLICATIONS:**

**<https://www.engineshed.org/>**

**(please sign up for email updates!)**