CLIMATE CHANGE AND COASTAL COMMUNITIES: WORKSHOP

University of Aberdeen/ Aberdeen City Council

20th August 2009

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WORKSHOP AGENDA

- Welcome to the Department (David Green)
- Background to the IMCORE project (David Green)
- Drivers of Climate Change (Peter Inglis)
- Open Discussion on:
  - What does Climate Change mean to you and your job?
  - What are the major issues concerning Climate Change affecting you and your job?
  - What are you and your organisation doing about Climate Change?

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WELCOME TO THE DEPARTMENT

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- IMCORE = Innovative Management for Europe's Changing Coastal Resource
- Funded under the Interreg IVB programme (www.nweurope.eu)
- Project goal is to promote a **trans-national, innovative and sustainable approach** to reducing the Ecological, Social and Economic impacts of climate change on the coastal resources of North West Europe.
- Partners composed of expert couplets from different countries in NW Europe (UK, Ireland, France, and Belgium)

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Innovative Management for Europe's Changing COastal REsource

AIM: To promote a transnational, innovative and sustainable approach to reducing the Ecological, Social and Economic impacts of climate change on the coastal resources of North West Europe.

GOALS

IMCORE is aiming to achieve the following:

- A demonstration of how the innovative expert couplet approach (i.e. collaboration between coastal practitioners and scientists using the principles of sustainability science), can help with the effective implementation of adaptive management strategies for coastal resources.
- The identification of impacts of a range of specified climate change scenarios on coastal sectors and the development of a response in the form of strategies for adaptive management.

In addition the partners, (listed below), will co-operate to fully utilise the benefits of transnational working in order to consider the following issues:

- How to address the impact of climate change on different socio-economic coastal sectors e.g. fishing, port development, marine recreation, & coastal defence?
- How to inform and assist coastal managers in the development of adaptive management strategies?

RATIONALE

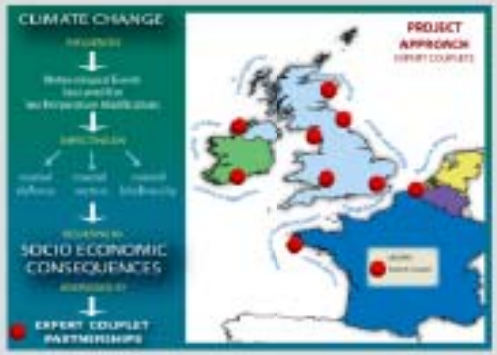
The Intergovernmental Panel on Climate Change (IPCC) has attributed global warming beyond that of normal climatic variation as a consequence of an accumulation of greenhouse gases in the atmosphere due to the burning of fossil fuels and changes in land use. The prospect of climate change has serious implications for the future development of coastal resources in North West Europe. This has been acknowledged by many reports, such as the State of the Coast Report by the European Environment Agency and the Stern Review on the Economics of Climate Change.

We need to increase our capacity to respond to the Ecological, Social and Economic (ESE) impacts of climate on the viability of coastal sectors such as fisheries and aquaculture, ports and shipping, marine recreation and coastal defence. To date, most attention has been focused on predicting the types and rates of change likely to occur in addition to exploring options for hard engineering solutions but what is needed now is a method to identify the adaptation measures that need to be applied to coastal use and management. This project aims to address by developing a methodology that will provide a template to aid Coastal Managers across Northern Europe develop the required adaptive strategies.

ACTIONS

- Build upon the lessons learnt from completed projects and programmes and link with current initiatives to fully realise the benefits of inter-project / programme exchange of ideas and outputs.
- Implement nine Expert Couplet Bodies across NW Europe to demonstrate innovative approaches to coastal resource management based on principles of sustainability science.
- Identify and characterise the key natural and anthropogenic processes which can lead to socio-economic impacts from climate change in the coastal zone of NW Europe. Utilise scenario building as a tool for envisioning coastal futures.
- Monitor and assist coastal managers in the development of in response to climate change scenarios.
- Promote the adoption of sustainability science for coastal management among coastal practitioners, policy makers and scientists.

These actions will be carried out in five discreet, but inter-connected workpackages, each with an individual co-ordinator as shown below.



LEARNING TO ADAPT
(Work Package Co-ordinator - Division)

INNOVATIVE APPROACHES TO MANAGEMENT
(Work Package Co-ordinator - Université de Bretagne Occidentale)

FUTURE SCENARIO BUILDING
(Work Package Co-ordinator – Cardiff University)

IDENTIFICATION OF DRIVERS (CLIMATE CHANGE & RELATED ISSUES)
(Work Package Co-ordinator – University of Ulster)

INFLUENCING CHANGE
(Coastnet)

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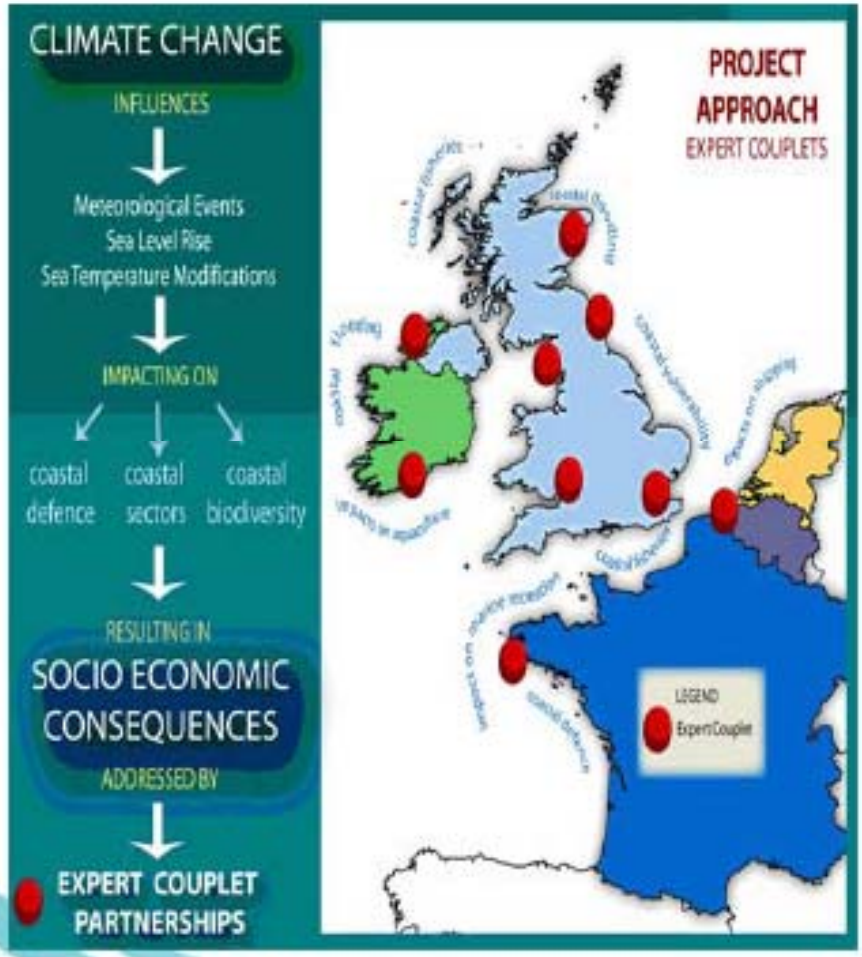
IMCORE – Expert Couplets



- **Cork** - Maritime heritage, coastal conservation
- **Donegal** - Marine spatial planning
- **Durham** - Integration of decision making across sectors, marine spatial planning, regional working
- **Cardiff** - Renewable energy generation
- **East England -** Public participation & socio economic indicators
- **Belgium** - Marine & coastal planning
- **Gulf of Morbhian** - Marine and coastal biodiversity
- **Sefton** - Local Information Systems, coastal conservation
- **Aberdeen -** Coastal regeneration

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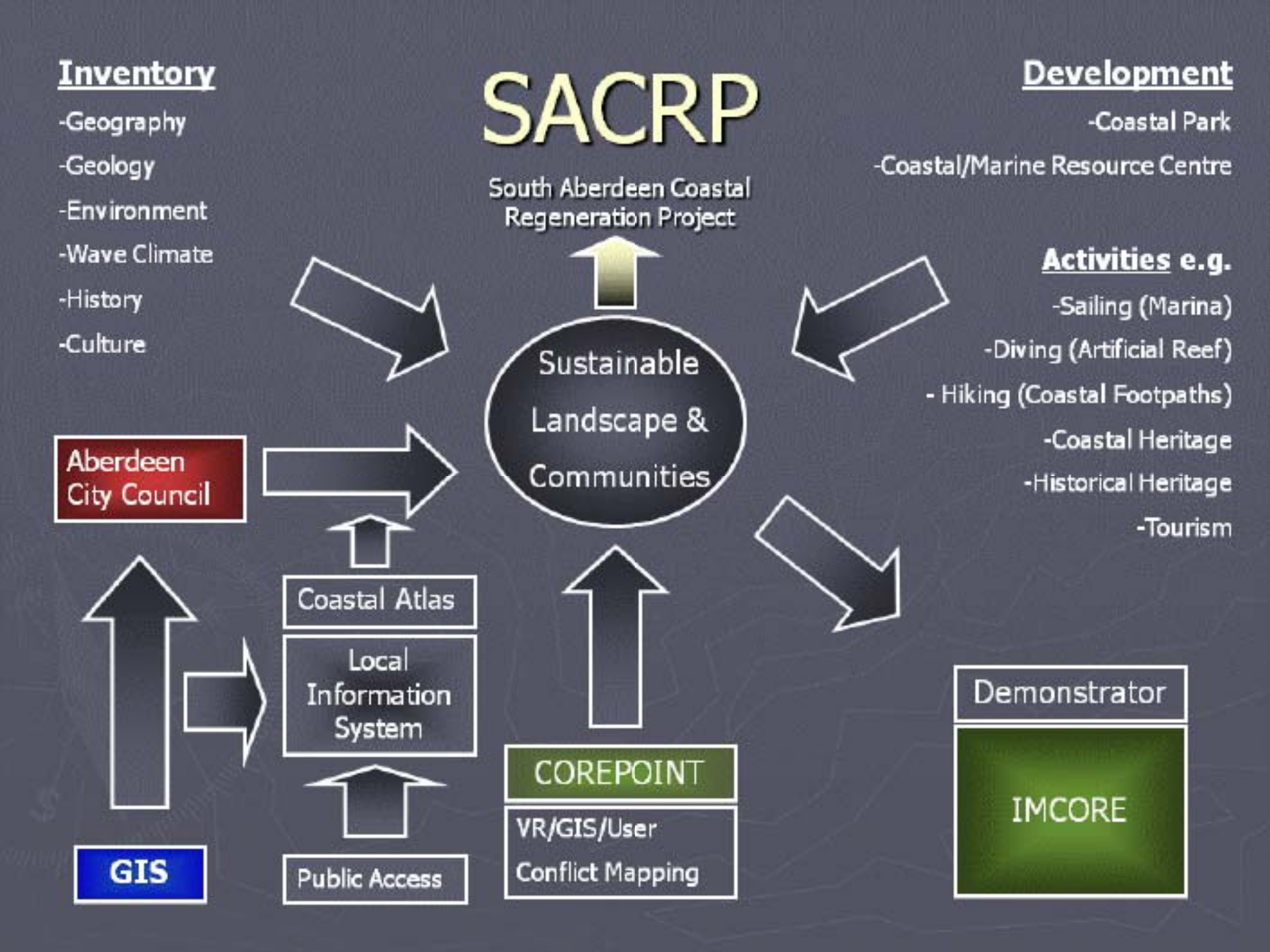
Inventory
-Geography
-Geology
-Environment
-Wave Climate
-History
-Culture
SACRP
South Aberdeen Coastal Regeneration Project
Development
-Coastal Park
-Coastal/Marine Resource Centre
Activities e.g.
-Sailing (Marina)
-Diving (Artificial Reef)
- Hiking (Coastal Footpaths)
-Coastal Heritage
-Historical Heritage
-Tourism
Sustainable Landscape & Communities
Aberdeen City Council
Coastal Atlas
Local Information System
GIS
Public Access
COREPOINT
VR/GIS/User Conflict Mapping
Demonstrator
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SACRP

- Coastal regeneration project focused on Nigg Bay and surrounding area
- Proposed projects include establishment of marine resource centre, boat ramp, artificial reef, coastal footpath, beach ridges, landscaping
- Coastal location will require consideration of potential future impacts from climate change

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SACRP - South Aberdeen Coastal Regeneration Project

Description:

SACRP is the South Aberdeen Coastal Regeneration Project

The focus of the project is in Nigg Bay to the south of Aberdeen City. This is an area that is under-developed and requires regeneration.

The area is defined by the sea, the enclosed rocky headlands, the boulder cliffs to the south, the beach, the apron of dune, [illegible] fragments and [illegible] materials and pre-existing built features – the car park, roads and the simple buildings on the north side.

There are several proposals for the redevelopment of the area. These include the construction of a marine and coastal resource centre, an artificial reef, breakwater, and a boat ramp.

Goals:

Local Information System – to create and develop a GIS-based local information system which will be used by Aberdeen City Council and other partners in an interactive mode.

Terrain Assessment – following a terrain assessment a draft field handbook/guide of the geological and geomorphological features of the coast along the coastal footpath between Nigg Bay and Cove will be created.

Marine Process Study – during the one-year scoping period wave parameters from the newly positioned buoy in Aberdeen Bay will be compiled and translated into coastal process information which will be the basis in assessing the range of possibilities for constructional proposals within and around Nigg Bay.

Comprehensive study of a marine and coastal centre proposal – the study will provide Aberdeen City Council with a range of options for the development of a marine and coastal centre along the shoreline of Nigg Bay.

Liaison with other coastal developments – the project is designed to ensure integration and awareness of other coastal developments along the coastline of Aberdeen City, at the outlet of the River Dee and northwards along the sediment cell of Aberdeen Bay.

Possible EU linkages – possibilities exist to incorporate best practice for sustainable coastal development as derived from European experience.

Outputs

Environmental datasets, databases, and online mapping systems, and a coastal atlas.

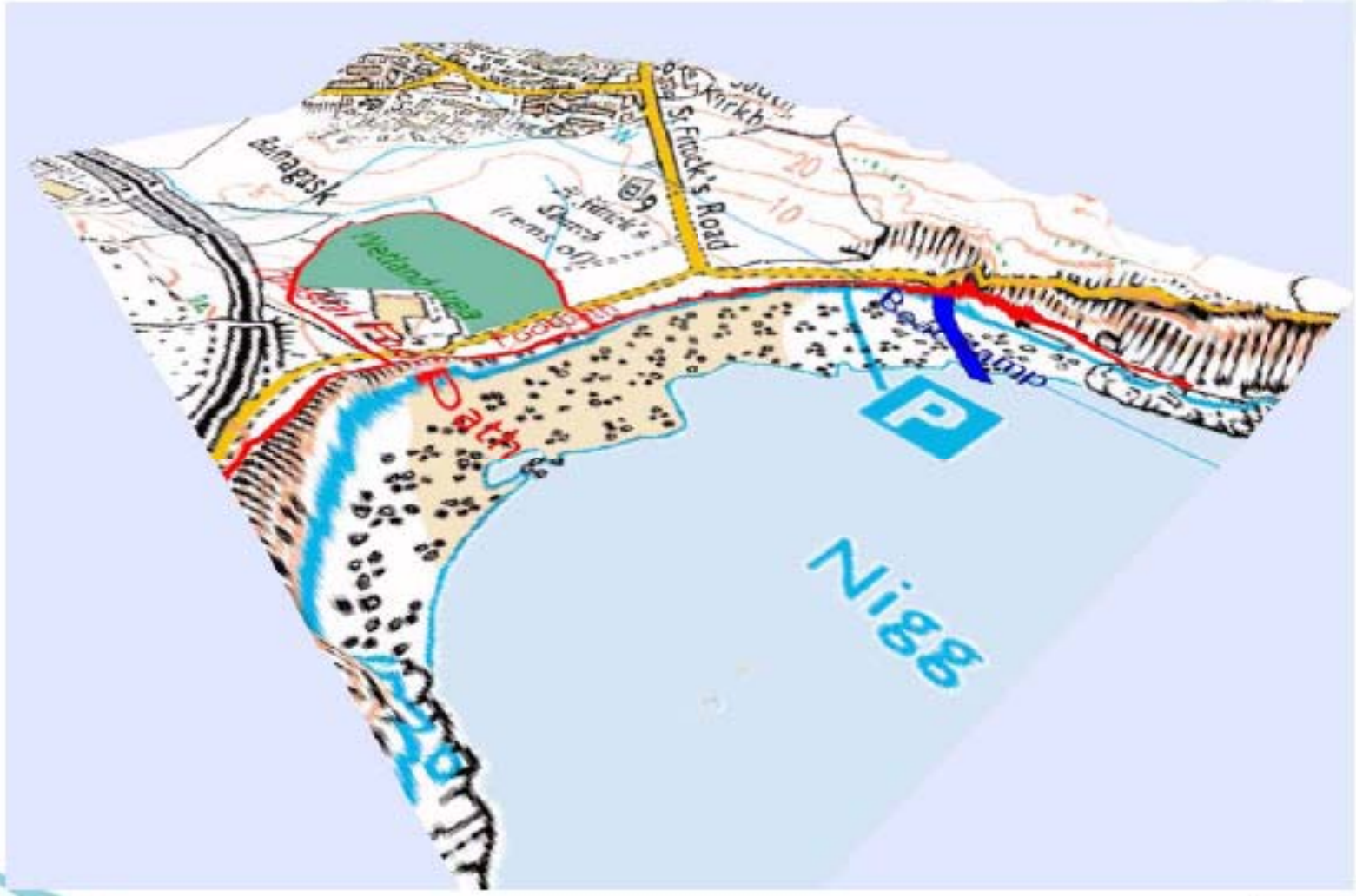
A Marine and Coastal Resource Centre is planned as a water activity centre for the local community as well as a field-based teaching centre for the Marine and Coastal Resource Management (MCRM) Degree Programme at the University of Aberdeen.

An artificial reef is planned. It will be constructed out of re-used materials and is supposed to protect the boat ramp and small boat harbour from the waves and strong tidal currents.

The closest point to Aberdeen to launch a boat is Stonehaven. With the construction of a boat ramp this will change. The boat ramp is also going to be used for marine educational purposes by Torry Academy.

University of Aberdeen - Aberdeen Harbour Board – East Grampian Coastal Partnership
Scottish Enterprise Grampian - -SEPA (Scottish Environment Protection Agency) - Scottish Water

NIGG BAY



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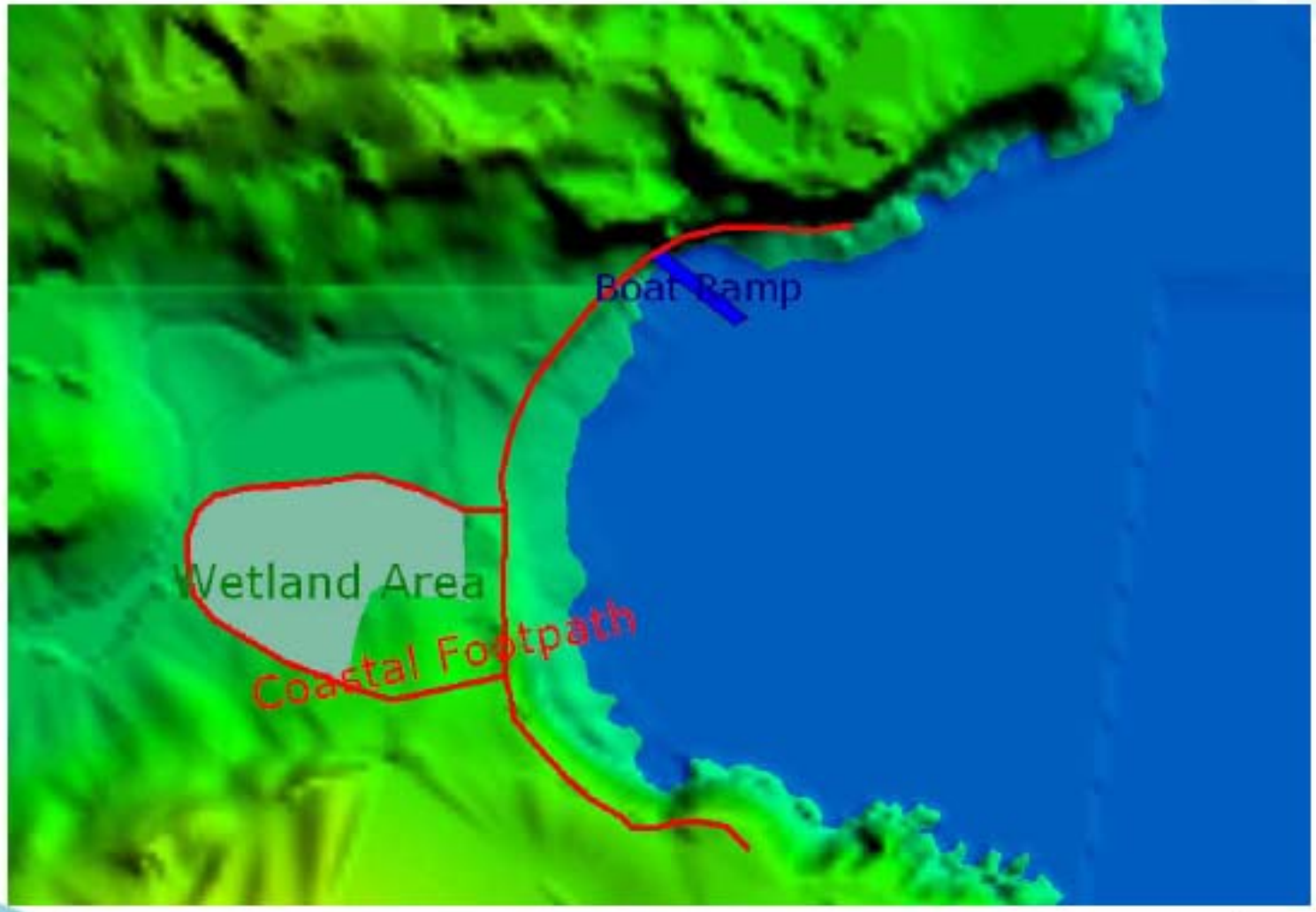
NIGG BAY



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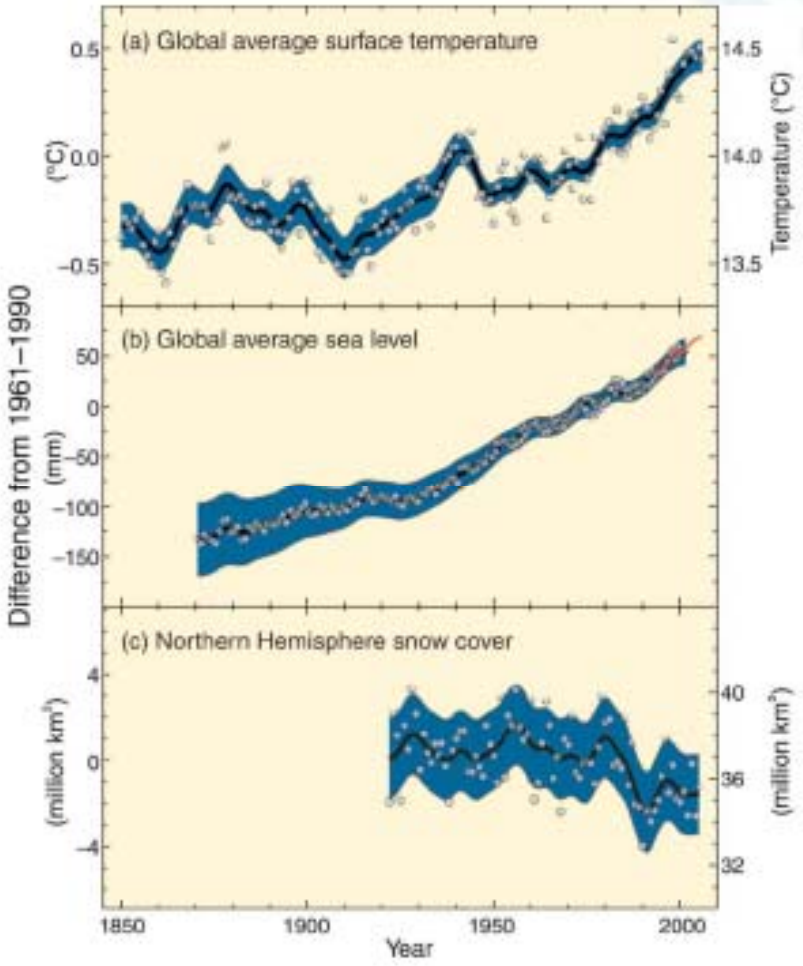
DRIVERS OF CLIMATE CHANGE

Natural Drivers:

- Changes in earth's orbit (Milankovitch cycles)
- Changes in sun's intensity
- Volcanism (emission of CO_2 and aerosols)
- Oceanic and atmospheric circulation patterns

Anthropogenic Drivers:

- Greenhouse gas emissions
- Land use/cover changes (e.g. deforestation, albedo effect)



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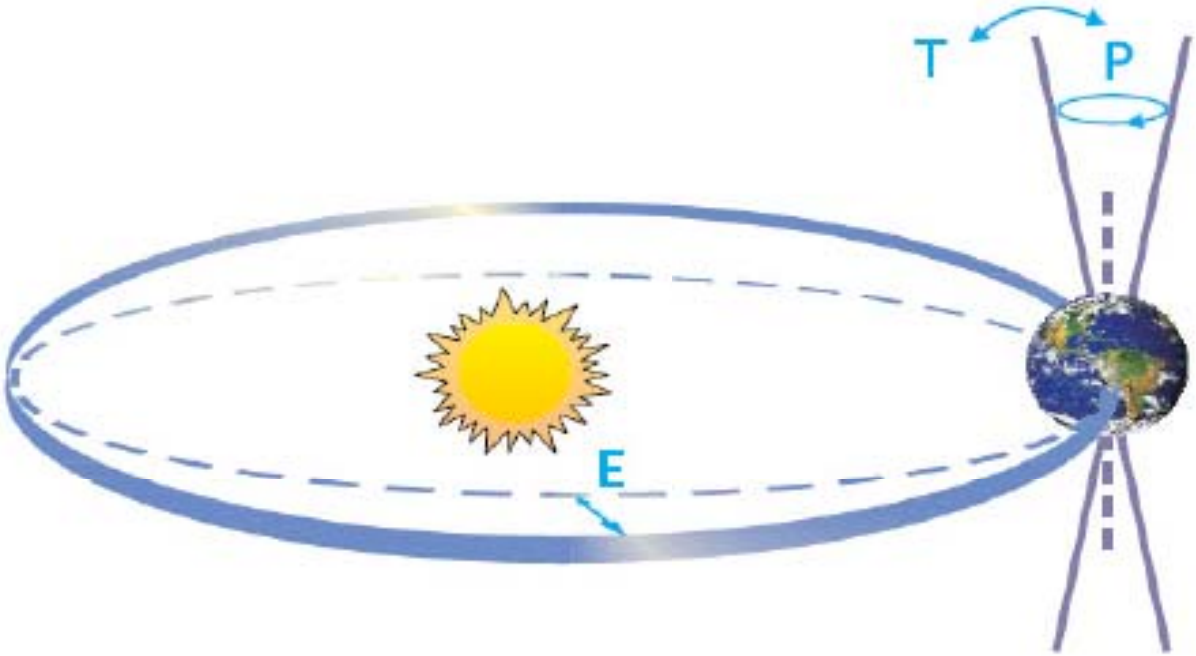
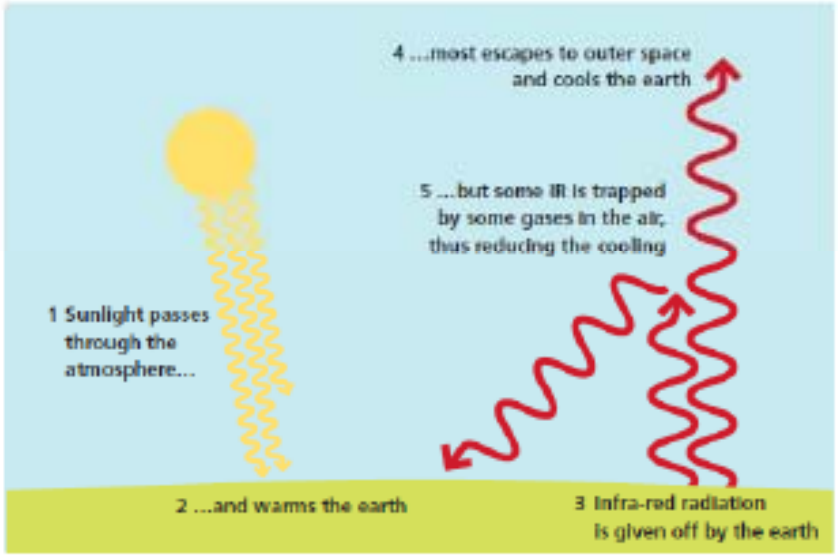
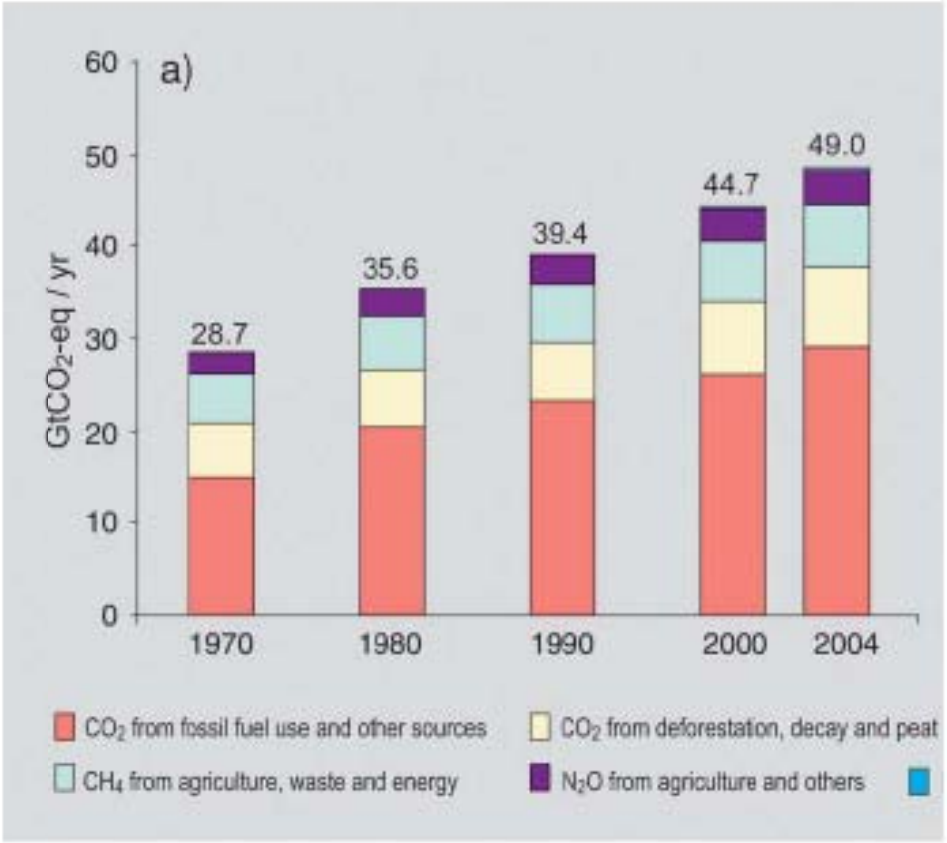
MILANKOVITCH CYCLES



Milankovitch Cycles. *Schematic of the Earth's orbital changes (Milankovitch cycles) that drive the ice age cycles. 'T' denotes changes in the tilt (or obliquity) of the Earth's axis, 'E' denotes changes in the eccentricity of the orbit (due to variations in the minor axis of the ellipse), and 'P' denotes precession, that is, changes in the direction of the axis tilt at a given point of the orbit. Source: Rahmstorf and Schellnhuber (2006).*

ANTHROPOGENIC DRIVERS – GREENHOUSE GAS EMISSIONS





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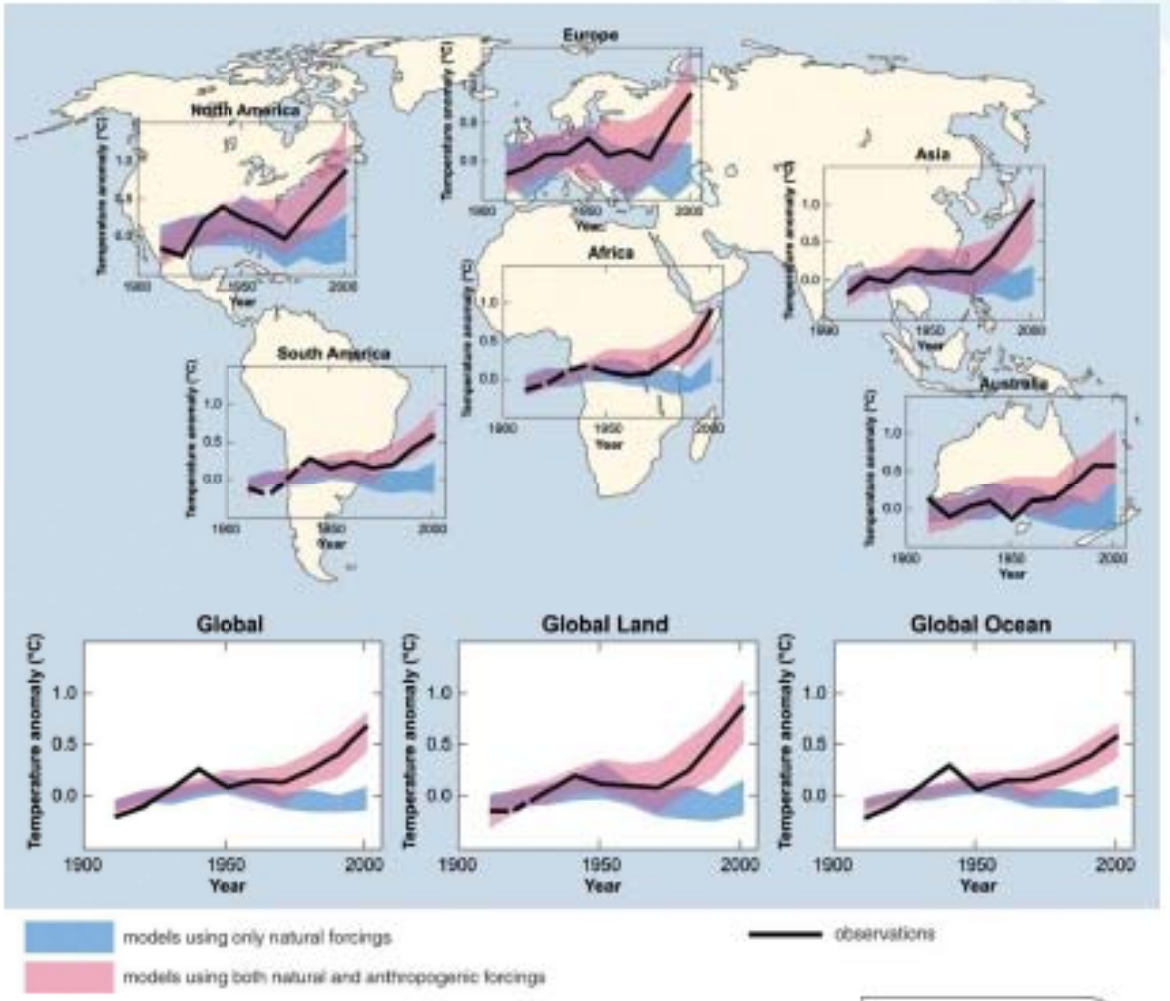
CLIMATE MODELS

- Models of projected climate change using only natural forcings fail to accurately account for warming trend.
- Only when anthro-pogenic causes are factored in do the models mirror actual climatic observations during the last century.



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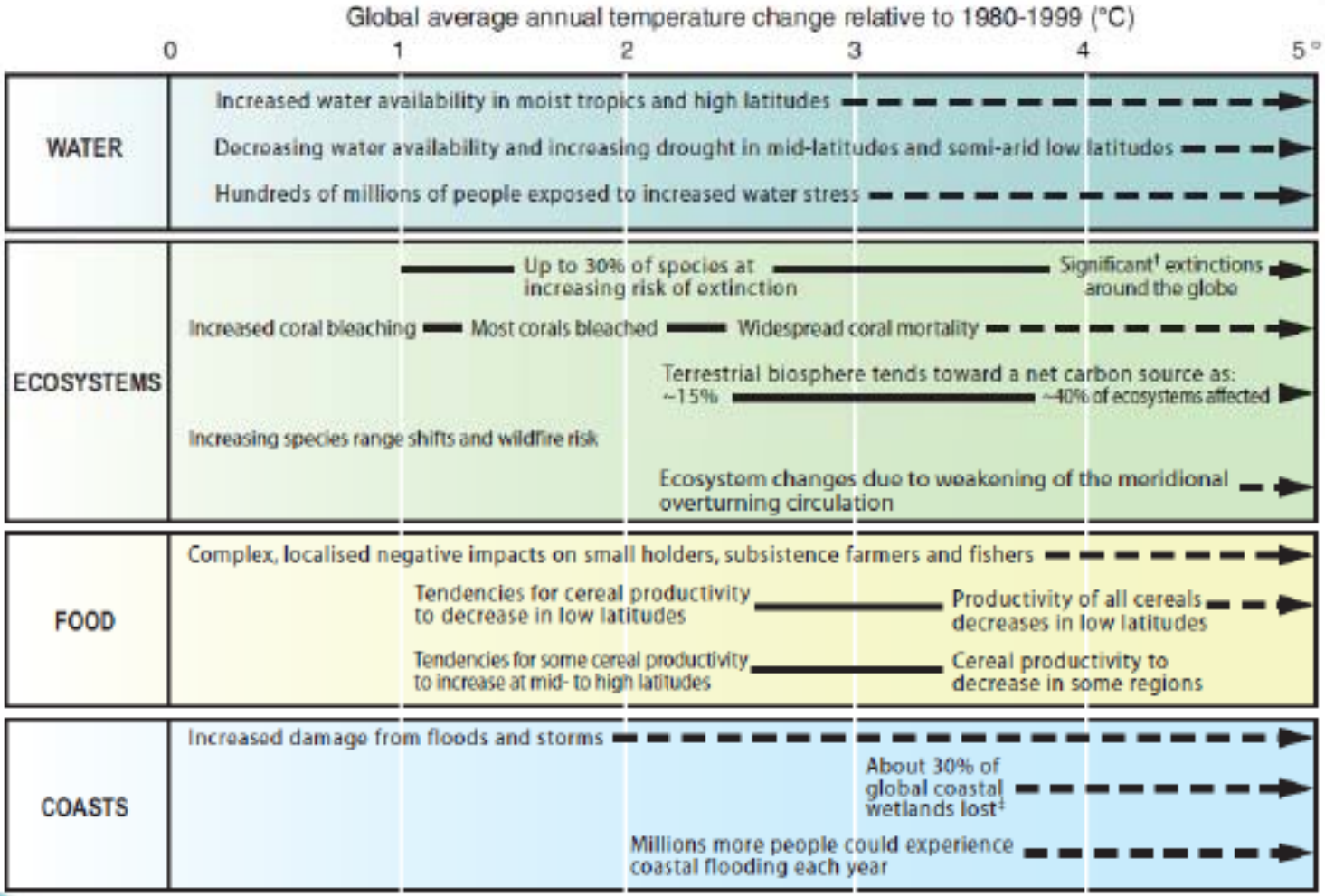
POTENTIAL GLOBAL IMPACTS



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UK IMPACTS - TEMPERATURE

Variable	Mean temperature, winter °C					Mean temperature, summer °C					Mean daily maximum temperature, summer °C					Mean daily minimum temperature, summer °C				
Probability level	10%	50%	90%	Wider range		10%	50%	90%	Wider range		10%	50%	90%	Wider range		10%	50%	90%	Wider range	
North Scotland	0.6	1.7	2.8	0.6	3.0	0.9	2.0	3.4	0.9	3.9	0.8	2.5	4.5	0.9	5.3	0.9	2.3	3.9	0.9	4.4
East Scotland	0.7	1.7	2.9	0.6	3.1	1.1	2.3	3.9	1.0	4.5	1.0	3.0	5.4	1.0	6.3	1.1	2.5	4.3	1.0	4.9
West Scotland	1.0	1.9	3.0	0.8	3.3	1.1	2.4	3.8	1.0	4.4	0.9	3.0	5.2	0.9	5.9	0.9	2.4	4.2	0.9	4.7
N Ireland	0.9	1.7	2.7	0.6	2.9	1.0	2.2	3.5	0.8	4.0	0.9	2.7	4.8	0.8	5.4	1.0	2.4	4.2	0.9	4.6
Isle of Man	0.9	1.8	2.7	0.7	3.0	1.1	2.3	3.7	1.0	4.2	0.9	2.9	5.1	0.8	5.7	0.9	2.2	3.9	0.8	4.4
NE England	1.0	2.0	3.1	0.8	3.4	1.2	2.5	4.1	1.1	4.7	1.0	3.2	5.7	0.9	6.4	1.0	2.5	4.4	0.9	4.9
NW England	1.0	2.0	3.0	0.8	3.3	1.2	2.6	4.1	1.1	4.7	1.0	3.3	5.8	1.0	6.5	1.0	2.5	4.4	0.9	4.9
Yorkshire & Humber	1.1	2.1	3.3	0.9	3.7	1.1	2.3	3.9	0.9	4.4	1.2	3.1	5.4	1.0	6.1	1.1	2.6	4.4	1.0	5.0
East Midlands	1.1	2.2	3.4	0.9	3.8	1.2	2.5	4.2	1.0	4.7	1.3	3.3	5.9	1.1	6.6	1.2	2.7	4.6	1.1	5.2
West Midlands	1.2	2.1	3.2	0.9	3.5	1.2	2.6	4.4	1.0	4.8	1.3	3.6	6.5	1.1	7.2	1.1	2.7	4.8	1.0	5.3
Wales	1.1	2.0	3.1	0.8	3.4	1.2	2.5	4.1	1.0	4.6	1.3	3.4	6.1	1.0	6.8	1.1	2.6	4.6	0.9	5.1
East England	1.1	2.2	3.4	0.9	3.8	1.2	2.5	4.3	1.0	4.8	1.3	3.4	6.0	1.1	6.8	1.2	2.7	4.7	1.1	5.3
London	1.2	2.2	3.5	0.9	3.8	1.3	2.7	4.6	1.1	5.2	1.4	3.7	6.5	1.2	7.3	1.3	2.9	5.0	1.2	5.6
SE England	1.1	2.2	3.4	0.9	3.8	1.3	2.7	4.6	1.1	5.2	1.4	3.7	6.5	1.2	7.3	1.3	2.9	5.1	1.2	5.7
SW England	1.1	2.1	3.2	0.8	3.5	1.3	2.7	4.6	1.1	5.1	1.4	3.8	6.8	1.2	7.6	1.2	2.9	5.0	1.0	5.5
Channel Isles	1.1	2.0	3.1	0.8	3.4	1.2	2.5	4.2	1.0	4.7	1.3	3.4	6.2	1.0	6.9	1.1	2.8	4.8	0.9	5.3

UK IMPACTS - PRECIPITATION

Variable	Annual mean precipitation %					Winter mean precipitation %					Summer mean precipitation %				
Probability level	10%	50%	90%	Wider range		10%	50%	90%	Wider range		10%	50%	90%	Wider range	
North Scotland	-6	0	+5	-7	+6	+3	+13	+24	0	+26	-23	-10	+2	-23	+6
East Scotland	-4	0	+5	-5	+6	+2	+10	+20	-1	+21	-26	-12	+1	-27	+6
West Scotland	-6	0	+5	-7	+6	+5	+15	+28	0	+30	-26	-12	+1	-27	+6
Northern Ireland	-3	0	+3	-3	+3	+2	+9	+19	0	+19	-26	-12	+3	-27	+8
Isle of Man	-5	0	+4	-6	+5	+2	+16	+35	-1	+36	-31	-15	+1	-32	+8
North East England	-4	0	+5	-5	+5	+1	+11	+24	0	+26	-29	-14	+1	-30	+7
North West England	-5	0	+6	-6	+7	+3	+13	+26	0	+27	-34	-17	+1	-36	+8
Yorkshire & Humber	-3	0	+4	-4	+5	+2	+11	+24	0	+27	-35	-17	+1	-37	+9
East Midlands	-4	0	+6	-5	+6	+2	+14	+29	+1	+33	-35	-15	+6	-37	+13
West Midland	-4	0	+6	-5	+6	+2	+13	+28	+1	+31	-36	-16	+6	-38	+13
Wales	-4	0	+5	-5	+6	+2	+14	+30	0	+31	-36	-16	+6	-38	+13
East England	-4	0	+5	-4	+6	+3	+14	+31	+1	+35	-37	-16	+6	-39	+14
London	-4	0	+5	-4	+5	+2	+15	+33	0	+37	-39	-18	+7	-41	+16
South East England	-4	0	+6	-5	+6	+2	+16	+36	+1	+40	-40	-18	+7	-42	+16
South West England	-4	0	+6	-5	+6	+4	+17	+38	0	+41	-41	-19	+7	-43	+16
Channel Islands	-4	0	+3	-4	+4	+2	+15	+34	0	+38	-47	-22	+9	-49	+20

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UK IMPACTS – MARINE CLIMATE

Variable	Mean temp winter °C					Mean temp summer °C					Precipitation winter %					Precipitation summer %				
Probability level	10%	50%	90%	Wider range		10%	50%	90%	Wider range		10%	50%	90%	Wider range		10%	50%	90%	Wider range	
Scottish Continental shelf	0.3	1.2	2.2	0.3	2.5	0.1	1.1	2.3	0.1	2.6	−5	0	+4	−8	+5	−8	−1	+6	−8	+8
Northwest approaches	−0.2	0.9	2.1	−0.2	2.3	−0.3	0.8	2.2	−0.3	2.5	−4	+4	+15	−4	+15	−7	−1	+6	−7	+6
West Scotland	0.3	1.1	2.2	0.3	2.5	0.1	1.2	2.5	0.1	2.8	−4	+1	+6	−9	+7	−8	−1	+7	−8	+8
Irish Atlantic approaches	0.7	1.4	2.4	0.6	2.7	0.6	1.5	2.5	0.6	2.8	−5	+5	+19	−5	+19	−18	−9	+1	−18	+3
Northern North Sea	1.0	1.8	2.9	0.9	3.1	0.9	1.8	2.8	0.9	3.1	+1	+9	+18	−2	+19	−9	−2	+6	−9	+7
Southern North Sea	1.4	2.2	3.3	1.2	3.7	1.2	2.1	3.2	1.2	3.6	+3	+11	+21	+1	+24	−32	−17	0	−33	+6
Irish Sea	0.6	1.4	2.3	0.6	2.6	0.3	1.5	2.9	0.3	3.3	−1	+6	+14	−2	+15	−25	−12	0	−25	+4
Southwest approaches	1.2	1.9	2.9	1.0	3.1	1.3	2.2	3.2	1.2	3.5	0	+11	+28	−3	+30	−43	−23	−2	−44	+7

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This project has received European Regional Development Funding through INTERREG IVB

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UK IMPACTS – SEA LEVEL RISE

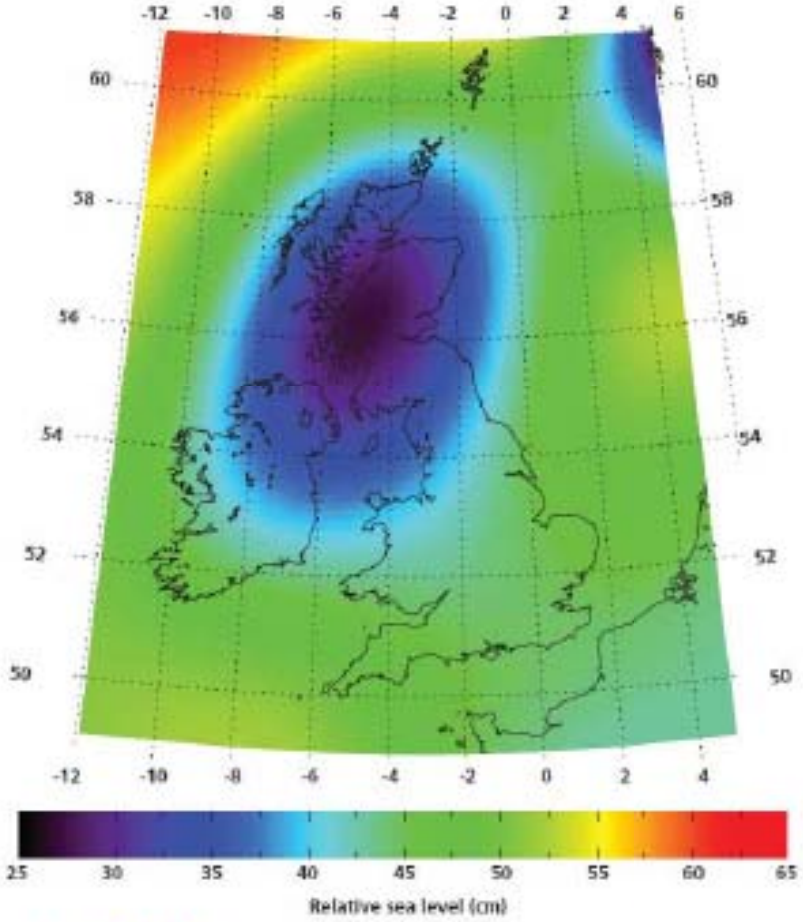

Figure 3.7: Relative sea level change (cm) around the UK over the 21st century. This combines the absolute sea level change estimates averaged around the UK for the central estimate for the medium emissions scenario (Table 3.3) and the vertical land movement as in Figure 3.5. Values are appropriate to 2095.

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UK IMPACTS – SEA LEVEL RISE

	London			Cardiff			Edinburgh			Belfast		
	High	Med	Low	High	Med	Low	High	Med	Low	High	Med	Low
2000	3.5	3.0	2.5	3.5	2.9	2.5	2.2	1.6	1.2	2.3	1.7	1.3
2010	7.3	6.2	5.3	7.3	6.2	5.3	4.7	3.5	2.6	4.9	3.8	2.8
2020	11.5	9.7	8.2	11.5	9.7	8.2	7.5	5.7	4.3	7.8	6.0	4.6
2030	16.0	13.5	11.4	15.9	13.4	11.4	10.7	8.2	6.1	11.1	8.6	6.6
2040	20.8	17.5	14.8	20.8	17.5	14.8	14.2	10.9	8.2	14.7	11.4	8.7
2050	25.9	21.8	18.4	25.9	21.8	18.4	18.0	13.9	10.5	18.6	14.5	11.1
2060	31.4	26.3	22.2	31.4	26.3	22.2	22.1	17.1	13.0	22.9	17.8	13.7
2070	37.2	31.2	26.3	37.1	31.1	26.3	26.6	20.6	15.7	27.4	21.4	16.5
2080	43.3	36.3	30.5	43.3	36.2	30.5	31.4	24.4	18.6	32.3	25.3	19.6
2090	49.7	41.6	35.0	49.7	41.6	35.0	36.5	28.4	21.8	37.6	29.4	22.8
2095	53.1	44.4	37.3	53.1	44.4	37.3	39.2	30.5	23.4	40.3	31.6	24.5

Table 3.4 (above): Central estimates of relative sea level changes with respect to 1990 (cm). Only the central estimates of sea level rise are presented here. These data correspond to Figure 3.6, which also gives the 5th to 95th percentile range.

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SUMMARY OF POSSIBLE LOCAL IMPACTS

- Increased temperatures from 2° to 3.5° C by 2080
- Increase in winter rainfall by 25%
- More intense storms
- Less snowfall by 90%
- Greater incidence of strong winds and larger waves
- Increased flood risks from rivers and seas, as well as possible sea level rise of 61cm
- Water temperature increase may affect geographical distribution of marine species and thus abundance of commercial species and marine mammals

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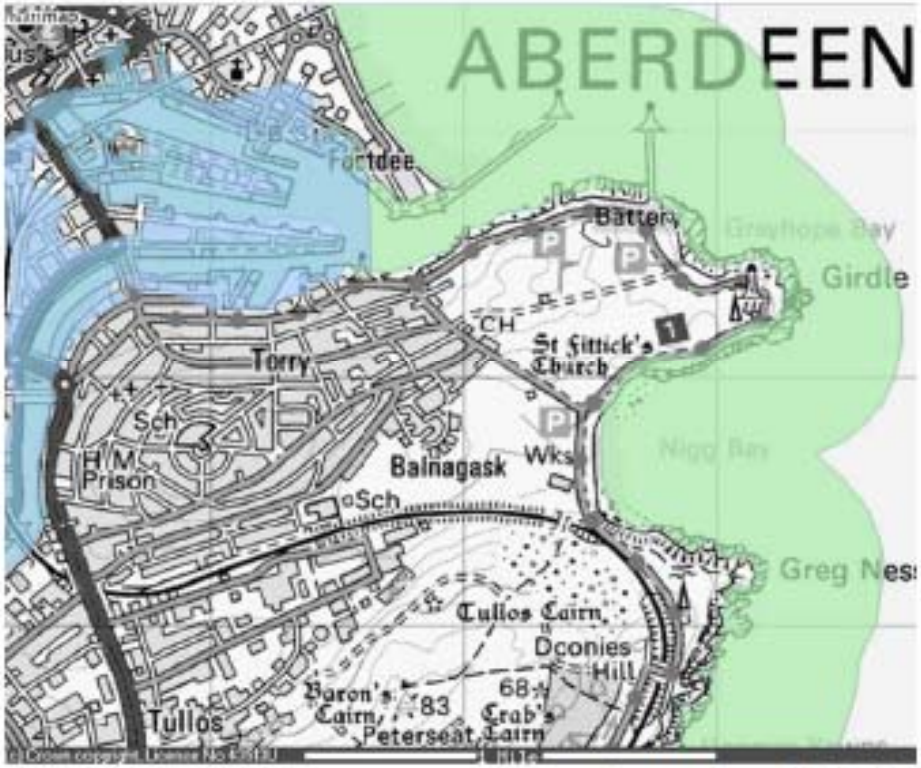
SEPA FLOOD MAPS

- Areas around Nigg Bay at risk of flooding from 200-year storm



Source: SEPA

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