‘Getting the message’

Delivering science to stakeholders through MCCIP

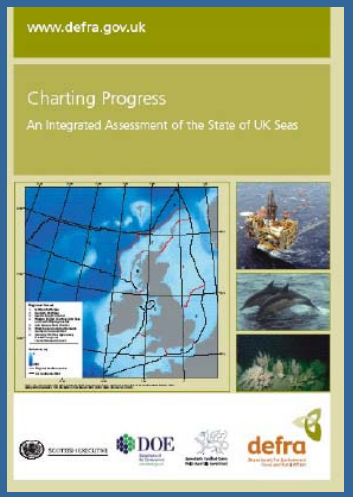
Paul Buckley

MCCIP programme manager

UK reporting on marine climate change impacts

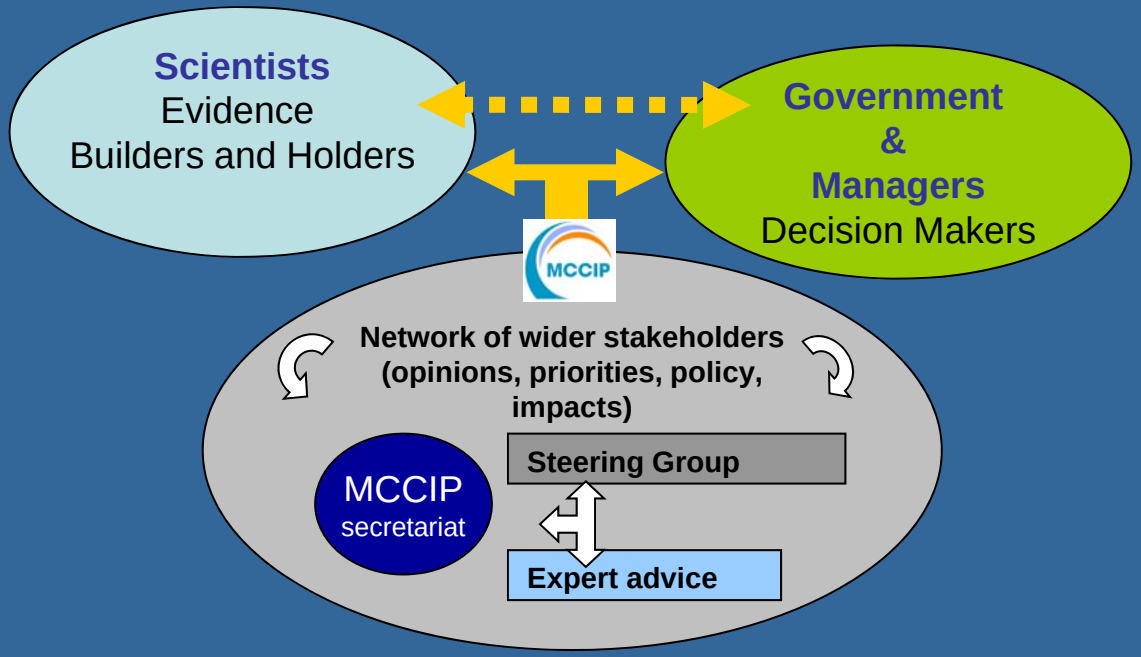
The UK government has set out a vision for…

'clean, safe, healthy, productive and biologically diverse oceans and seas'



…yet as recently as 2005, 'charting progress', was unable to assess potential impacts of climate change on the UK's marine environment.

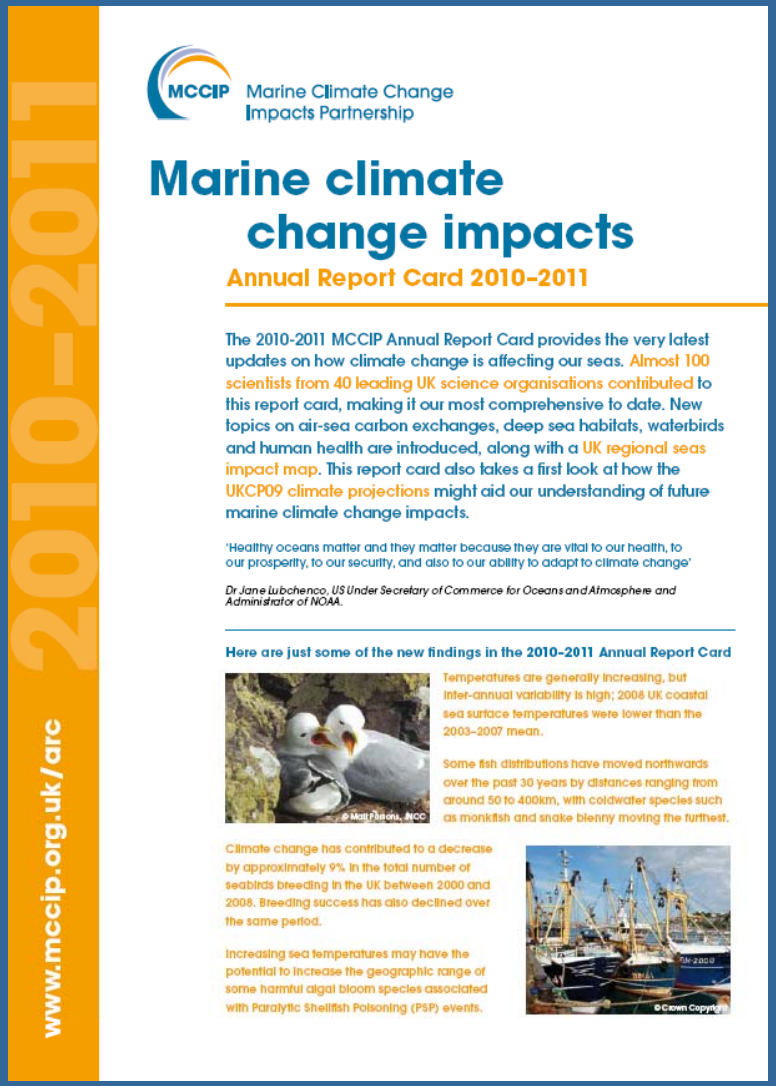
In response, the Marine Climate Change Impacts Partnership (MCCIP) was established.



MCCIP Partners

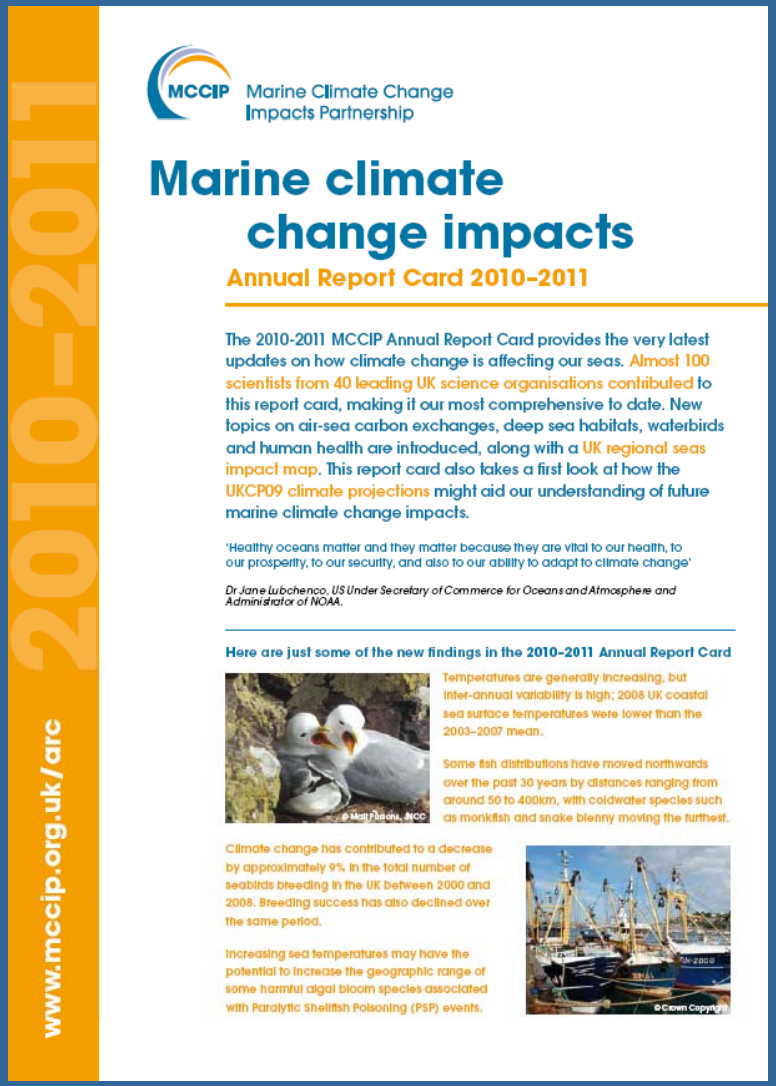
MCCIP Annual Report Card 2010-11

Building a 'science community' view



- Latest report published **mid-July 2010**
- **100 scientists** from **40 institutes** contributed on **30 topics**
- 12 page-summary card with **headline messages**
- Communicates **uncertainty** on each topic
- Highlights changes to **ocean climate** (e.g. warming UK seas) and impacts on **biodiversity**, **cleanliness and safety** and **commercial interests**

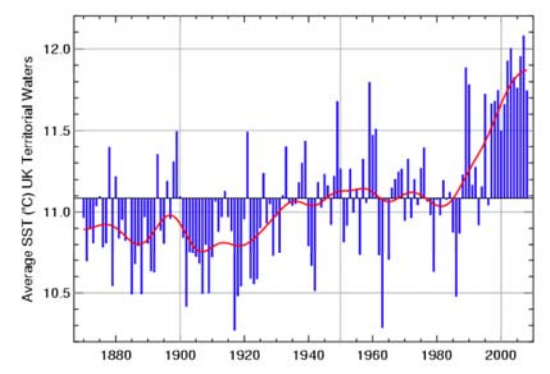
MCCIP report card



- Shows marine impacts are **not just about SLR, coastal flooding and erosion** but also on ecosystem functioning and habitats.
- **Potentially important impacts on commercial interests** such as ports and shipping, tourism, fisheries and aquaculture.

MCCIP report card

Some key findings



Ocean Climate

SSTs: Rising since 1980s around UK, esp. SE England. 2006 2nd warmest since 1870 but 2008 relatively cool showing importance of short term natural variability.

SST rises up to 3 deg C by 2100 around UK.

Storms and waves: Hard to tease out climate change signal and future predictions highly uncertain.

SLR: Greater in S England than Scotland. Latest UK projections for 12-76cm rise by 2100 but may be higher.

Coastal impacts

Coastal habitats are being lost around the UK and will be accelerated by sea level rise.

Coastal erosion affects 17% of coast and is expected to increase as is **coastal flooding**, especially in E England.

MCCIP report card

Some key findings

Biological diversity

Mismatch in **plankton** production for higher trophic levels.

Northerly movements of plankton, fish, intertidals etc..

Reduced prey availability for some **seabirds**.

Non-Natives are likely to become established in future.

Harmful blooms may be increasing in some areas.

Commercial impacts

Fisheries: Some losses of coldwater species but some increases seen (e.g. bass / squid). OA impacts on shellfish in future?

Tourism: longer season, more comfortable than Med?

Infrastructure: potential high impacts through erosion, SLR and storms. Major risks to ports and shipping possible.

Something else to worry about?

Marine vibrios are an important group of pathogens with human health implications

Vibrio vulnificus is common in marine & estuarine environments. Whilst infections are rare (<100 yr/USA), it carries the **highest mortality rates of any bacterial pathogen.**

Causes primary septicaemia and necrotizing wound infections. Most cases involve the ingestion of **raw oysters.**

Incidence of *V. vulnificus* is **strongly associated with sea water temperature.**

During the unusually warm summer in **Denmark in 1994,** 11 clinical cases of *Vibrio vulnificus* infection were reported.

MCCIP Annual Report Card 2010-11

Healthy and biologically diverse topics

Climate Change: impacts on our vision for a healthy and biologically diverse marine ecosystem

To access the full peer reviewed reports, go to: www.mccip.org.uk/arc/healthy

As the marine ecosystem is highly interconnected through predator-prey relations, the direct impacts of ocean climate change have 'knock-on' effects up the food-chain. For example, recent warmer conditions and associated changes in plankton abundance and geographical distribution have led to reduced availability of prey fish for some seabirds, which has been strongly linked to recent poor breeding success and reduced survival rates.

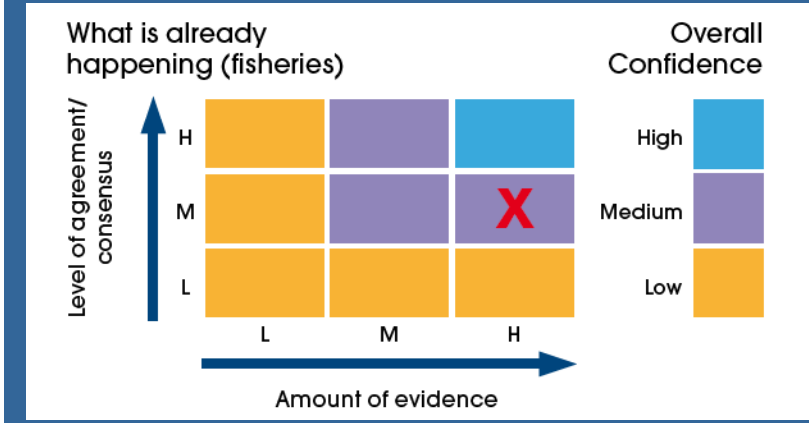
Where headline messages under each topic are new for 2010-2011, they are highlighted in bold text. Arrows show change in confidence since the 2007-2008 MCCIP Annual Report Card. Where a topic is referred to in the 'regional snapshot' map, a map symbol appears.

	WHAT IS ALREADY HAPPENING	WHAT COULD HAPPEN
Plankton *SAHFOS; Strathclyde University*	**High Confidence** ↑ • In the North Sea, the population of the previously dominant and important cold-water zooplankton species *Calanus finmarchicus* has declined in biomass by 70% since the 1960s. • There has been a northward shift in the distribution of many plankton species by more than 10° latitude over the past 50 years. • The seasonal timing of plankton production has altered with some species appearing up to four to six weeks earlier than 20 years ago, which is having an effect on predators. • The effects of an abrupt ecosystem shift in the late 1990s were most pronounced in regions of the north-eastern Atlantic near the 9-10°C sea surface temperature isotherm, a critical thermal boundary between 'warm' and 'cold' water ecosystems. As waters warm this boundary has moved northwards.	**Low Confidence** ↔ • Future warming is likely to alter the geographical distribution of phytoplankton and zooplankton, affecting ecosystem services such as oxygen production, carbon sequestration and biogeochemical cycling.
Fish *Cefas; Strathclyde University*	**Medium Confidence** ↔ • Some fish distributions have moved northwards over the past 30 years by between 50 to 400km, with coldwater species such as monkfish and snake blenny moving the furthest. At the same time, some have moved into deeper waters at an average rate of about 3.5 metres per decade. • Warmer temperatures around the UK are correlated with poor conditions for survival of cod larvae and cod growth, but enhanced growth rates in sole (a warm-water species). • Diadromous species (which spend some of their life in both fresh and marine waters) such as salmon and eel have been shown to be particularly vulnerable to climate change (water temperature and river flow) with impacts on both the freshwater and marine phases.	**Medium Confidence** ↑ • By 2050, climate change may lead to pelagic species (such as herring and anchovy) moving northward by an average of 600km and demersal species (such as cod and haddock) by 220km. • Changes to currents may have an impact on the dispersal of fish eggs and larvae. It is anticipated that winter and early spring spawners (such as cod and plaice) will experience poor larval survival, whereas warmer-water species (such as sprat) may benefit.
Seabirds *JNCC; CEH*	**Medium Confidence** ↔ • Between 2000 and 2008, the total number of seabirds breeding in the UK decreased by approximately 9%. Breeding success also declined. Climate change is partly responsible. • Major changes in plankton abundance in the North Sea have contributed to the reduction in quality and abundance of prey species such as sandeels. • The greatest reductions in breeding success of species most sensitive to food shortages, such as Arctic skua, black-legged kittiwake and shag are seen in the Northern North Sea and Scottish Continental Shelf.	**Low Confidence** ↔ • Models predict that by 2100, UK climate will no longer be suitable for great skua and Arctic skua. The same models predict that the geographic range of black guillemot, common gull and Arctic tern will shrink so that only Shetland and the most northerly tips of mainland Scotland will hold breeding colonies. • Any increased storminess would reduce the amount of safe breeding habitat for shoreline-nesting species (e.g. terns) and create unfavourable foraging conditions at sea, which may lead to starvation of adults and chicks of some species.
Marine Mammals *SWF; SMRU; University of Aberdeen*	**Low Confidence** ↔ • Evidence of impacts from climate change are difficult to distinguish from the impacts of human activities such as those that cause prey depletion, incidental capture in fishing gear, pollution and disturbance. • In the temperate zone, some species of toothed whales and dolphins are showing shifts in distribution, which may be linked to increasing sea temperatures.	**Low Confidence** ↔ • The most likely impacts will be from changes in prey distribution and abundance. • Species that have relatively narrow habitat requirements are the most likely to be affected (e.g. shelf sea species like harbour porpoise, white-beaked dolphin and minke whale). • Reduced plankton availability may directly affect some baleen whale species that feed at least in part upon zooplankton. • Increased coastal flood risk could affect seal haul-out and breeding sites in low-lying areas and caves.

	WHAT IS ALREADY HAPPENING	WHAT COULD HAPPEN
Waterbirds *BTO*	**Low Confidence** NEW • Overwintering wader distributions have shown an eastward and northward shift. In recent years numbers of some species have declined as birds have overwintered further east in Europe as conditions have improved there. • Overwintering wildfowl are showing similar distribution shifts.	**Low Confidence** NEW • Waders and wildfowl may be more susceptible to intermittent severe weather events in the future. • Changes in the Arctic and sub-Arctic are expected to lead to reduced availability of suitable breeding grounds and increased predation pressure.
Non-natives *Queen's University, Belfast; Marine Scotland; MBA*	**Medium Confidence** ↔ • The distribution and reproductive capabilities of many non-native marine species have been limited by water temperatures. • The introduced Pacific oyster (*Crassostrea gigas*) spread from oyster farms in the early 1990s, becoming established in southern England. Similarly new self-sustaining populations are now established in Northern Ireland with recruitment occurring in favourable years. • Rising water temperatures may have contributed to the expansion in range of a number of species such as the bryozoan *Bugula neritina*, previously restricted to warm water areas such as power station outlets, and the red seaweed *Caulacanthus ustulatus* which was introduced from Asia and spread rapidly to Devon in 2004, Cornwall in 2005 and Kent in 2009.	**Low Confidence** ↓ • Changes in ocean physics and chemistry could favour some non-native species over native species. • Current sea temperature projections are thought likely to result in certain species such as *Crassostrea gigas* recruiting every year in Northern Ireland, Wales and south-west England by 2040.
Coastal Habitats *NE; CCW; National Coastal Consultants; SNH*	**Medium Confidence** ↔ • Coastal habitats are being affected by changes to the amount of sediment being supplied and removed as a result of natural processes and human intervention. • Past human intervention and modification of coastal habitats means they have a reduced capacity to adapt naturally to climate change impacts.	**Low Confidence** ↔ • Continued sea-level rise, and other climate change related factors are expected to have an impact on the extent, distribution and quality of various coastal habitats.
Intertidal Habitats *MBA*	**Medium Confidence** ↔ • Biodiversity is increasing in southern areas as warm water species extend their distributions faster than cold water species are retreating. • Changes in geographic distributions of rocky shore species have continued with the range limits of southern species moving up to 12km further north (e.g. *Osilinus* species) between surveys undertaken in July 2007 and July 2009. • Population abundances of the topshell *Gibbula umbilicalis* have increased throughout the UK and in warmer southern areas they have switched to having two periods of gonad maturation per year. This was observed for the first time in 2008/2009. Such a strategy is more characteristic of populations inhabiting warm waters and lower latitudes.	**Medium Confidence** ↔ • The further development of hard coastal defences to tackle sea-level rise could provide 'stepping stones', enabling some rocky shore species to further expand their range. • More information is required to quantify the impacts of climate change on seagrass beds, mudflats, and other soft sediment communities.
Shallow and Shelf Subtidal Habitats *Cefas; Oxford University; MBA; University of Wales, Bangor*	**Low Confidence** ↓ • We lack information on ecosystem dynamics over the range of shallow and shelf subtidal habitats, which hinders our ability to identify and understand large-scale climate change effects. • There is no obvious signal of warming effects in sediments in southern and south-western areas where changes would be most expected. However, changes in crustacean abundance in some locations and the occurrence of previously undocumented species in others (e.g. brittle star *Amphiura incana* and shrimp *Athanas nitescens*) suggest some degree of climate-influence. • Increased seawater temperatures have been linked with disease outbreaks in seafans, changes in algae distribution and abundance, and the appearance and increased occurrence of a previously unrecorded warm-water barnacle *Solidobalanus fallax* in southern and south-western areas.	**Low Confidence** ↔ • Changes already documented in soft-sediment communities are expected to continue, and probably escalate, in response to the cumulative effects of seawater warming and ocean acidification. • Cold-water coral species and maerl may experience shifts in distribution as a result of intolerance to raised seawater temperature and altered chemistry, with knock-on effects on community composition and function.
Deep-Sea Habitats *SAMS; NOC*	**Low Confidence** NEW • A detailed assessment of climate change impacts on deep-sea ecosystems is difficult due to the scarcity of sustained observations. Climate driven changes in surface waters could already be having a direct impact through the quantity of food being delivered to the sea bed in any given year.	**Low Confidence** NEW • Predicting future changes is extremely difficult due to lack of baseline data and appropriate models at this time.

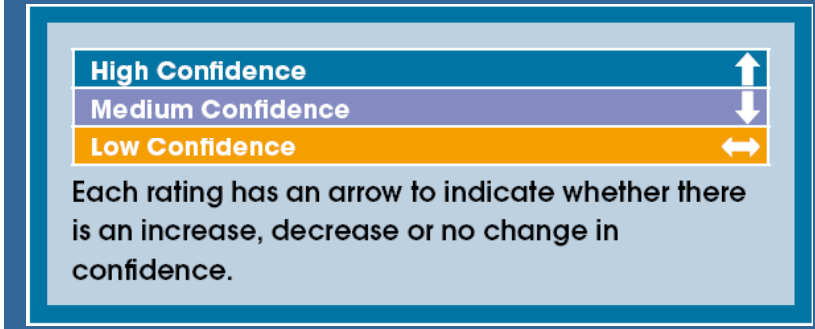
MCCIP Annual Report Card 2010-11

Confidence assessments



- Authors asked to consider **level of confidence** in the science for **'what is already happening' and 'what could happen in the future'** for each topic

- Authors marked an 'X' in a grid-box to indicate confidence based on **'level of agreement / consensus'** and **'amount of evidence available'.** Selection scrutinised through **peer review**



- **Changes in the level of confidence** since the last report card shown as arrows for each topic

- **Confidence may go up or down** due to new data and model outputs becoming available or through changes in our understanding of the science

In Summary...

...the summary card only scratches the surface!

Full expert contributions, from which the headline messages were pulled are available at:

www.mccip.org.uk/arc

Raising the profile of UK marine climate change impacts

Media coverage of the 2007-2008 ARC launch

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Source: Scottish Executive

Published Wednesday, 16 January, 2008 - 10:46

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Fishermen's grouping welcomes climate change move

Published: 16 January, 2008

RESPONDING today to the annual 'report card' produced at the meeting in Edinburgh of the Marine Climate Change Impacts Partnership, Scottish Fishermen's Federation chief executive Bertie Armstrong said he welcomed the forum as a means for providing clear information on the current status of climate change.

Bertie Armstrong

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Last Updated: Wednesday, 16 January 2008, 10:57 GMT

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'Big climate impact' on UK coasts

Climate change is having a major impact on Britain's coast, the seas around the coast, and the life in those seas, a government-sponsored report concludes.

The Marine Climate Change Impacts Partnership (MCCIP) says seas are becoming more

The coasts of Britain, especially

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Britain: Climate Change Threatens Coasts

EcoSolutions

January 15, 2008 -- Updated 0251 GMT (1051 HKT)

UK: Coasts under climate threat

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MCCIP predicts climate change will affect U.K.

Posted On: Jan. 16, 2008 3:26 AM CST

By Stuart Collins

LONDON—Industries that rely on the U.K.'s marine environment—shipping and fisheries—are likely to experience a significant impac change, according to a report published Wednesday.

Associated Press

UK: Climate Change Impacts Coasts

By RAPHAEL G. SATTER – 2 days ago

LONDON (AP) — Climate change is warming Britain's waters, eroding it harming its marine wildlife and increasing the likelihood of devastating st floods, the government said in a report published Wednesday.

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Changing climate 'is leading to rougher seas'

By Paul Eccleston

Last Updated: 12:01am GMT 16/01/2008

Climate change is having a significant impact on the health of the seas surrounding Britain, says a new report.

- Britain on alert as floods threaten once more

Rising seas, bigger waves, flooding, and more violent storms are already happening as temperatures increase.

MCCIP Ecosystem linkages report card 2009

MCCIP launched a ‘special topic’ report card in mid-2009 looking at **ecosystem connections:**

• Topics focus down from **broad scale to local scale issues** (acidification – arctic sea ice - food webs - non-natives - coastal economies and people)

• Aimed to help politicians, policy makers, advisors and stakeholders **understand how marine climate change impacts come together.**

Go to…www.mccip.org.uk/elr

From evidence to action in the marine ‘sector’

Understanding risk and adapting to change

- The marine and coastal ‘sector’ is **very complex**, with a huge variety of issues and an incredibly **diverse** range of stakeholders

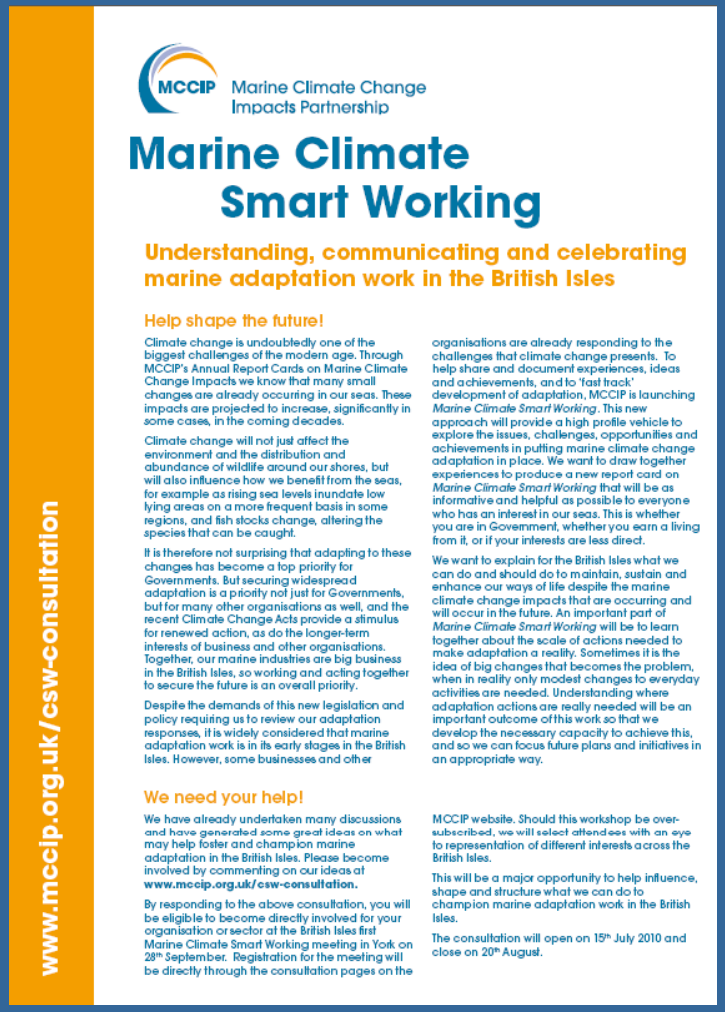
- Scientific understanding of climate change impacts **less developed** than atmospheric / terrestrial environment, especially future scenarios

- It is widely considered that marine adaptation work is in its **early stages** in the British Isles, but high up agenda for UK and DA’s

- **UK climate change risk assessment** underway, will be laid before parliament in early 2012 (then every 5 years). The most ‘critical’ risks for the marine sector are now being identified and risk ‘metrics’ agreed

MCCIP Marine Climate Smart Working

Doing our bit for adaptation...



MCCIP Marine Climate Change Impacts Partnership

Marine Climate Smart Working

Understanding, communicating and celebrating marine adaptation work in the British Isles

www.mccip.org.uk/csw-consultation

Help shape the future!

Climate change is undoubtedly one of the biggest challenges of the modern age. Through MCCIP's Annual Report Cards on Marine Climate Change Impacts we know that many small changes are already occurring in our seas. These impacts are projected to increase, significantly in some cases, in the coming decades.

Climate change will not just affect the environment and the distribution and abundance of wildlife around our shores, but will also influence how we benefit from the seas, for example as rising sea levels inundate low lying areas on a more frequent basis in some regions, and fish stocks change, altering the species that can be caught.

It is therefore not surprising that adapting to these changes has become a top priority for Governments. But securing widespread adaptation is a priority not just for Governments, but for many other organisations as well, and the recent Climate Change Acts provide a stimulus for renewed action, as do the longer-term interests of business and other organisations. Together, our marine industries are big business in the British Isles, so working and acting together to secure the future is an overall priority.

Despite the demands of this new legislation and policy requiring us to review our adaptation responses, it is widely considered that marine adaptation work is in its early stages in the British Isles. However, some businesses and other organisations are already responding to the challenges that climate change presents. To help share and document experiences, ideas and achievements, and to 'fast track' development of adaptation, MCCIP is launching *Marine Climate Smart Working*. This new approach will provide a high profile vehicle to explore the issues, challenges, opportunities and achievements in putting marine climate change adaptation in place. We want to draw together experiences to produce a new report card on *Marine Climate Smart Working* that will be as informative and helpful as possible to everyone who has an interest in our seas. This is whether you are in Government, whether you earn a living from it, or if your interests are less direct.

We want to explain for the British Isles what we can do and should do to maintain, sustain and enhance our ways of life despite the marine climate change impacts that are occurring and will occur in the future. An important part of *Marine Climate Smart Working* will be to learn together about the scale of actions needed to make adaptation a reality. Sometimes it is the idea of big changes that becomes the problem, when in reality only modest changes to everyday activities are needed. Understanding where adaptation actions are really needed will be an important outcome of this work so that we develop the necessary capacity to achieve this, and so we can focus future plans and initiatives in an appropriate way.

We need your help!

We have already undertaken many discussions and have generated some great ideas on what may help foster and champion marine adaptation in the British Isles. Please become involved by commenting on our ideas at **www.mccip.org.uk/csw-consultation.**

By responding to the above consultation, you will be eligible to become directly involved for your organisation or sector at the British Isles first Marine Climate Smart Working meeting in York on 28th September. Registration for the meeting will be directly through the consultation pages on the MCCIP website. Should this workshop be over-subscribed, we will select attendees with an eye to representation of different interests across the British Isles.

This will be a major opportunity to help influence, shape and structure what we can do to champion marine adaptation work in the British Isles.

The consultation will open on 15th July 2010 and close on 20th August.

- MCCIP is at a stage where we are well established in communicating **impacts** evidence, with **strong buy-in** from scientific and stakeholder communities

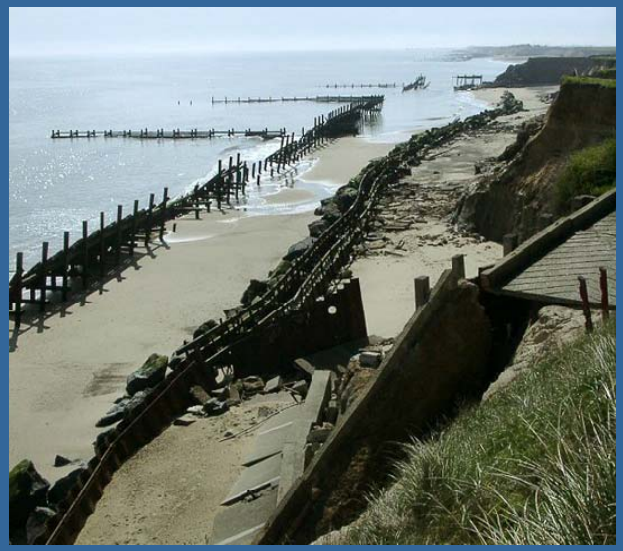
- Now we want to build on this platform to help stakeholders **build adaptive capacity**, no easy task!

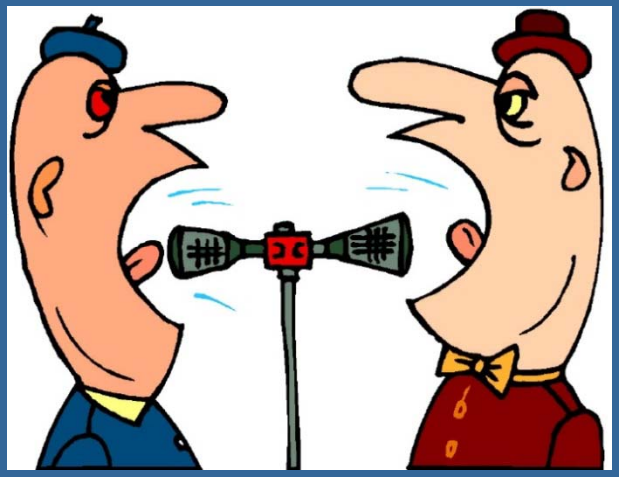
- MCCIP Marine Climate Smart Working **officially launched** at same time as 2010-2011 report card

- Aims to work closely with marine sectors to provide **practical advice** that sectors can act on, not just high level principles.

Marine Climate Smart Working

How will we recognise success?



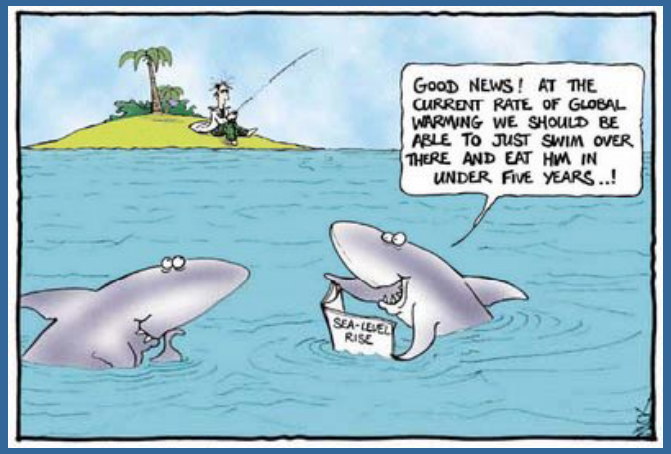


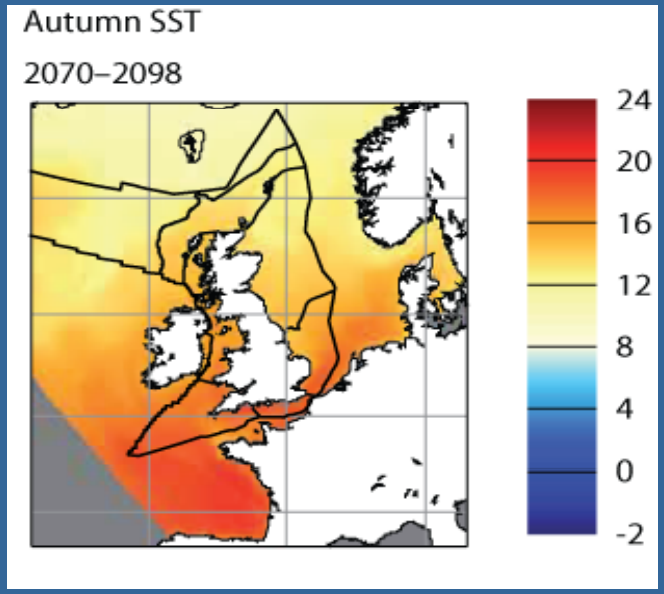
In 5 years time...

- The need and actions for marine adaptation are **widely recognised**
- Government has a **greatly improved** evidence base on marine adaptation action and associated needs
- Greater **communication** across sectors leading to enhanced activity on adaptation
- More **actions** being taken on adaptation
- Underlying science is **better targeted and delivered in a way that practitioners can use**
- Greater **visibility** all round through MCCIP and partners focussing the debate

MCCIP ‘phase II’

What else does the future hold?





- 2nd **expanded 5-year programme** gets underway soon with new adaptation work programme.
- A **scientific ‘knowledge gaps’** paper soon
- New **special topic** on fish, fisheries and aquaculture launched by end of 2011
- **Full report cards** every 2 years (with special topics every other year)
- Provide **advice on user needs** for future marine climate scenarios
- Facilitate **provision of scientific evidence** on climate change for regional, national and European marine assessments

Useful information

Email: Office@mccip.org.uk

Website: www.mccip.org.uk

Mailing list: e-mail us to join up, stating your job role & organisation