CLAMER
CLIMATE CHANGE &
EUROPEAN MARINE
ECOSYSTEM RESEARCH

Sea Change:

Public views on marine climate change impacts in Europe

This report card provides a brief overview of the opinions expressed by 10,000 European citizens on marine climate change risks and impacts through a survey commissioned by the Climate Change and European Marine Ecosystem Research (CLAMER) project. This survey was complemented by a participatory workshop, a review of relevant studies and a review of EU scientific outreach activities. Together, these provide unique and compelling insights into how citizens relate to marine climate change and how the EU can improve public engagement on these issues.

These are the main messages:

- The public clearly cares about climate change, ranking it second most important in a list of major global issues. Most people believe that climate change is at least partly caused by humans.
- The public is most concerned about coastal and marine issues that are not directly linked to climate change (e.g. pollution, over-fishing and habitat destruction). However some climate change impacts, such as sea level rise and flooding, also scored highly.
- Estimates provided by the public for rates of sea level rise and temperature change matched the scientific consensus, suggesting that some fundamental messages are getting through.
- In line with other surveys of perceptions of climate change, European citizens trust scientists working for universities and environmental NGOs more than those working in government and industry. The EU is trusted more than national and local government and television is trusted more than newspapers or the Internet.
- Personal action taken by European citizens to combat climate change tends to focus on mitigation measures (e.g. reducing energy use and using sustainable transport) rather than efforts to cope with climate change impacts by adapting, for instance by protecting their homes against flooding.
- Support is highest for EU and national policy responses to make coastal and marine environments more resilient (e.g. through tightening controls on pollution). Mitigating climate change (e.g. through international agreements) is also seen as important. Adaptation measures were ranked lower.
- On the whole there is a clear link between awareness of issues and the top perceived research priorities, with research on melting sea ice seen as most important.
- Comparing the results by country or by age and gender reveals some marked differences in opinions. The EU needs to recognise these differences if it is to formulate effective communication strategies in the future.

Why are we interested?

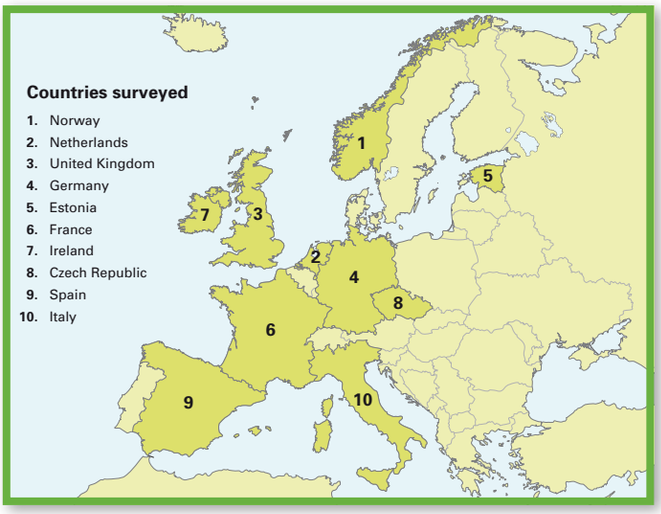
One of the CLAMER project's most important tasks has been to understand how European citizens perceive and connect with the impacts of climate change on marine and coastal environments. A review of previous surveys revealed that while there is a growing body of work on public perceptions of climate change in general, little research has been carried out specifically focusing on the coast or the sea. In fact, little attention has been given to public perceptions of coastal and marine environmental issues in general.

The CLAMER online public survey of 10,000 European citizens is the first of its kind to focus on public perceptions of marine climate change impacts. The poll provides insight into how European citizens identify with climate change impacts at the coast and in the sea, and how they perceive the importance of climate change issues in the context of other marine issues such as pollution, overfishing and habitat destruction.

What we did

1) Online survey

- The online survey interviewed 1000 participants in each of ten countries across Europe, providing statistically robust, nationally representative data including key demographics such as gender and age from which we could examine results at national and pan-European levels.
- The ten countries were selected on the basis of their proximity to different European regional seas from the Arctic through to the Mediterranean. One country without a coastline, the Czech Republic, was included for comparison.



- A robust sub-sample of citizens living near the coast was included in each country to allow comparisons with those living further inland.
- The survey was conducted from January 5-24, 2011.

2) Qualitative study

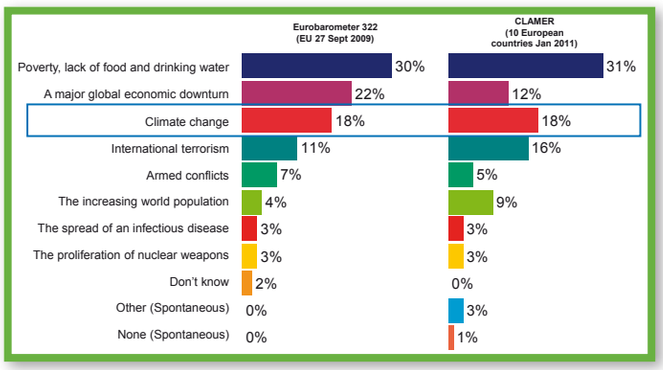
The in depth, follow-up study comprised informal discussions lasting a single day with 20 members of the UK public and several climate change and marine environmental specialists.

Ten members of the public came from Norwich, a city about twenty miles from the sea with a population of about 132,000. The remaining ten participants were drawn from coastal parishes of Norfolk. The group was selected by a market research company to reflect the demographics of the region. The main aim was to investigate the underlying factors that influence public understanding of climate change in relation to marine and coastal environments, to complement the international survey and help to interpret its findings. Ideally, similar studies would have been held in each of the ten countries surveyed, but the resources available did not allow this.

Public perception of climate change in Europe and the wider world

The CLAMER survey of 10,000 European citizens first examined how citizens rank climate change as a serious global problem in relation to other major risks and issues.

When asked about their general perceptions of a predefined list of 8 major global risks, 18 per cent of respondents selected climate change as the most serious problem facing the world. This result exactly matches a previous large-scale study conducted amongst all 27 EU countries in 2009 (Special Eurobarometer 322), indicating that European public concern about climate change as a major global issue had neither declined nor increased in the intervening 18 months.



'In your opinion, which of the following do you consider to be the most serious problem currently facing the world as a whole?'

In the CLAMER survey there were marked differences in responses at country level, notably with a higher percentage of Spanish and Irish respondents (21 per cent) ranking climate change the most serious problem facing the world as a whole compared to only 13 per cent of the UK population and just 12 per cent of those from the Czech Republic.

There were some interesting differences according to age, with a significantly higher percentage of respondents in the younger age brackets (18-44) seeing climate change as the most serious problem compared to those aged over 55 and in particular over 65. A slightly higher proportion of those living near the coast selected climate change as the 'most serious problem facing the world' than those inland (20 per cent versus 17 per cent).

Have recent events shaken public belief in climate change?

A number of issues have arisen over the past two years that could be expected to have shaken public belief in climate change science across Europe. Firstly, northern Europe experienced unusually cold winters in 2009/10 and 2010/11, although 2010 also witnessed summer heat waves across much of Eastern Europe.

Secondly there was widely reported criticism of the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report, regarding a mistake in the projected retreat of Himalayan glaciers.

Finally there was controversy in November 2009 when a computer server in the UK was hacked into: climate sceptics said that the documents released showed evidence that global warming was nothing but a scientist's conspiracy, although these claims were later proved to be unfounded.

A UK Ipsos-Mori survey released in February 2010 showed that the percentage of people who believed that climate change is 'definitely' happening had fallen from 44 per cent to 31 per cent over the year to the middle of January 2010. A Populus poll for the BBC conducted on 3-4 February revealed that 25 per cent of people did not think global warming was happening, an increase of 10 per cent since the previous November.

The survey results published here, however, as well as those of other surveys released shortly after the various stories above broke in the media, do not suggest a significant long-term change in public attitudes across Europe.

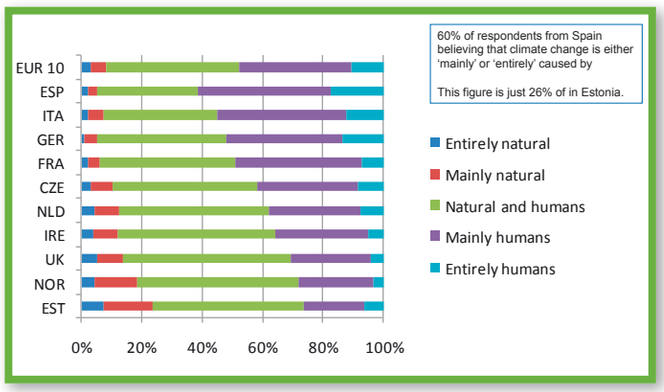
Views on the causes of climate change

Almost half of all respondents (46 per cent) believed that climate change is either 'mainly' or 'entirely' caused by human activity, and 42 per cent suggest that it is caused 'partly by natural processes and partly by human activity'.

Only 8 per cent believed that climate change is either 'mainly' or 'entirely' caused by natural processes. This is much lower than in the United States, where levels are typically around 32-36 per cent (see *Climate Change in the American Mind,* published by Yale University in 2010).

Figures vary widely by country, with 60 per cent of respondents in Spain believing that climate change is either 'mainly' or 'entirely' caused by human activity compared to just 26 per cent of respondents in Estonia. An almost equal number of Estonians (23 per cent) thought that climate change is 'mainly' or 'entirely' caused by natural processes as thought that it is mostly caused by humans.

There was a slight tendency for more people in the older age groups to suggest that climate change is primarily caused by natural processes, and equally slightly more people in the youngest age groups suggested that humans are mainly or entirely responsible.



Thinking about the causes of climate change, which, if any, of the following best describes your opinion? (All ten countries combined plus individual country responses).

How does the public perceive coastal and marine environments?

The ten-country survey intially asked people to identify, in their own words, three important environmental matters relating to the coastline or the sea. The answers reveal that for the public overall in these ten European countries, pollution is by far the most important environmental matter in relation to the coastline or the sea. Only four per cent of responses included the phrase 'climate change'. In other words, when asked to think about environmental issues at the coastline or in the sea the public does not tend to highlight or prioritise climate change as the main issue.

'Word cloud' of important environmental matters in relation to the coastline and sea (all ten countries combined)

As the word cloud above shows, in addition to the high number of responses that mention pollution in general, a considerable proportion also specify 'oil pollution'. It is possible that the high levels of publicity given to the Deepwater Horizon disaster off the Florida coast in 2010 contributed to the prominence of this particular problem in people's minds.

Comments from members of the UK public who took part in the CLAMER in-depth study suggest that individuals' understanding of coastal and marine environmental issues is based both on personal experience and media information.

There was a great deal of consistency among the responses to this question at national level, but there were also some differences among countries.

'I'm a gardener, so I collected some seaweed from the beach. There were so many tiny pieces of plastic, we had to sort all that out, and also the plastic strings you get on balloons were all caught up in the seaweed.'
(Marion)

'We've had the disaster that happened off the coast of Florida, oil pipelines, various oil tankers that have spilled out and it's all causing pollution.'
(Bill)

What marine and coastal environmental matters does the public see as important?

Some key country differences

- Aesthetic considerations accounted for almost 9 per cent of French and 6 per cent of Estonian responses, but did not appear as such in responses from any other country.
- The problem of algal blooms was important to the public in France and Estonia but apparently not in any of the other eight countries.
- Coastal development was an important issue for respondents in Spain (9 per cent of responses) and to a lesser extent Italy (4 per cent of responses), but these were the only countries where it was mentioned.
- Rubbish/litter was perceived as a particularly important problem in the Czech Republic, Estonia and Ireland.
- Two per cent of responses from the Czech Republic identified air quality as an important issue, but it was not mentioned elsewhere.
- Almost 19 per cent of responses from the UK and 16 per cent from Ireland – more than any other country –identified coastal erosion as an important environmental matter.
- Coastal erosion did not show up at all in responses from the Czech Republic, Spain or Norway.
- Sea temperature rise accounted for 2 per cent of responses to this question in both Italy and Norway, but hardly figured at all in responses from other countries.

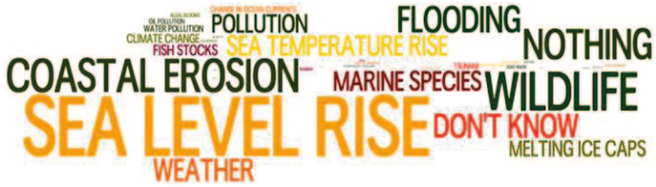
Is climate change seen as an important environmental issue for the coastline or sea?

Although the phrase 'climate change' appeared in only 4 per cent of responses to this question, several specific marine and coastal climate change impacts were mentioned as 'important marine environmental matters', notably coastal erosion, sea level rise, melting ice caps, sea temperature rise and flooding.

Combining the above for each country reveals that some national populations do perceive marine climate change impacts as important. For instance, in Ireland and the UK, combining coastal erosion, sea level rise and climate change account for 24 per cent and 27 per cent of responses respectively.

How does the public perceive coastal and marine climate change impacts?

After asking respondents to name important coastal and marine environmental matters in general, the survey then asked them to name three marine or coastal impacts of climate change, again in their own words. In answers to this question sea level rise was mentioned most often, accounting for almost 14 per cent of responses. Responses worded as 'nothing' or 'don't know' combined came a very close second. This indicates that a large part of the public struggles to identify any marine climate change impacts.



Word cloud: Impacts of climate change on the coastline or the sea (all ten countries combined)

Some key country differences in responses on coastal and marine climate change impacts

- 'Sea level rise' was the most frequent response in Germany (18 per cent of responses), the Netherlands (16 per cent), France (14 per cent), Spain (13 per cent) and Norway (13 per cent).
- 'Coastal erosion' was the most frequent response in Ireland (19 per cent), the UK (18 per cent) and Italy (9 per cent).
- In the Czech Republic, 'wildlife' was the most frequent response (12 per cent).
- In Estonia, the most common response was 'don't know' (11 per cent) with a further 8 per cent saying 'nothing'.
- In both Spain and France, 'tsunamis' accounted for about 2 per cent of responses to this question, indicating that these respondents connect tsunamis with climate change.

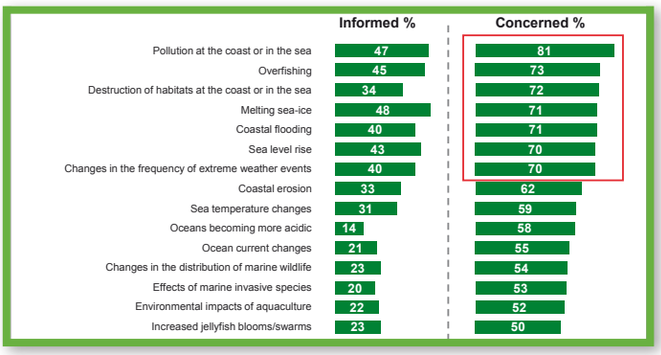
'I can remember seeing just a picture of a single polar bear floating on a small block of ice, when the whole area would have normally been ice, and I thought that was just awful.'
(Bill)

'Flooding, I think that's an issue. They have said in about 100 years' time Norwich is going to be under water.'
(Michael)

'I certainly didn't know about this, what do you call it, I can't even say it; acid? acidification? I'd never even heard of that.'
(Barbara)

How well informed are the public?

The CLAMER survey sought to gain better understanding about which marine climate change issues the European public know and care about. It was also important to place understanding of, and concern about, marine climate change issues within the context of other marine environmental matters (such as pollution and over-fishing). Respondents were asked how informed and concerned they felt about 15 predetermined marine environmental issues on a 5-point scale ranging from 5 (very well informed) to 1 (not informed at all).



'How informed, and concerned, do you feel about each of the following?'

Social science research shows that that survey respondents can often overstate both their level of knowledge and their concern about any issue put to them. Consequently our results should be interpreted as a broad ranking of the extent to which citizens feel informed.

Many people felt well, or quite well informed about well-publicized issues such as melting Arctic sea ice (48 per cent), pollution (47 per cent) and overfishing (45 per cent), but claimed to know much less about more complex issues such as ocean acidification or impacts on wildlife. In general, more coastal than inland respondents reported being very well informed or well informed on the issues listed (most notably coastal erosion and jellyfish swarms), although on many issues the difference was not large.

There are some notable differences by country and across demographic groups in both how informed and how concerned people consider themselves to be about particular issues. With regard to the questions on how well informed respondents felt:

- German respondents claimed to be the best informed of the 10 countries about of 6 the 15 topics covered, and Italians on 5 of the topics, Dutch and Estonian respondents claimed to be least informed on 5 topics each.
- Citizens in Germany, the United Kingdom and Ireland are the best and Estonia the least informed about overfishing.
- Italy and Spain are the best and the UK, Netherlands and Czech Republic the least informed about the effects of marine invasive species.
- Estonia and France are the least informed regarding ocean acidification, with 75 per cent of respondents reporting only minimal or no knowledge at all about this issue.

How concerned are the public?

There was generally a strong correlation between how informed respondents perceive themselves to be and how concerned they were, although there were also some anomalies. This was particularly true for ocean acidification, with only 14 per cent of people claiming to be well-informed about this issue, while 58 per cent were concerned about it.

Focusing on the 'concerned' question, sea pollution clearly strikes a strong chord with citizens across Europe, as it was ranked highest by a wide margin across all ten countries. It is interesting that the next two marine environmental matters that respondents are concerned about are non-climate related issues. However, some issues that relate more directly to climate change came very close behind, most notably melting sea ice, coastal flooding, sea level rise and changes in the frequency of extreme weather events.

Comments from participants in the CLAMER in-depth study indicate that, for some members of the public, their degree of concern depends very much on how immediate and relevant to their own lives marine climate change impacts are seen to be.

'Thermohaline circulation? Nothing to do with me!' (Michael)

'It's local and immediacy that make you more concerned about something.' (Carrie)

'Concern' about 10 of the 15 issues discussed was highest amongst Italians, while overall concern about all 15 topics was lowest in Norway (least concerned of all countries about 6 of the 15 topics), the Netherlands (least concerned about 5 topics) and Estonia (least concerned about 4 topics).

This part of the survey revealed some surprising findings from the Netherlands. While coastal flooding and sea level rise were the joint second biggest concerns for the Dutch (61 per cent each), this was well below the average of around 70 per cent for these issues across all 10 countries. This difference was even more marked for melting sea ice, at 16 per cent less than the 10-country pooled average of 71 per cent. In general members of the Dutch public are less concerned about climate change issues than citizens of other European countries, despite the country's vulnerability to sea level rise.

Coastal flooding and sea level rise are issues of particular concern in Ireland. Invasive species and jellyfish swarms are viewed as a particular concern in Italy and Spain.

Are there demographic differences in awareness and concern?

- Women generally expressed more concern than men about all the issues
- Older people expressed more concern than younger people, especially those in the 55-64 age bracket compared to 18 to 34-year-olds.
- Men considered themselves better informed about most of the topics than women did.
- Respondents living in coastal areas claimed to be both more informed *and* more concerned than those living inland did, on all 15 issues.
- At the 'informed' level, differences between coastal and non-coastal populations were particularly apparent regarding coastal erosion (41 per cent vs 29 per cent respectively) and jellyfish blooms (30 per cent vs 20 per cent respectively).
- Among those 'concerned', differences between coastal and non-coastal populations were particularly marked regarding coastal erosion (71 per cent vs 59 per cent), ocean current changes (61 per cent vs 52 per cent), marine invasives (61 per cent vs 50 per cent) and jellyfish blooms (58 per cent vs 47 per cent).
- People visiting or living near the Baltic and Mediterranean expressed the most concern about sea temperature change compared to those with experience of other European seas. People visiting or living near the Mediterranean were also generally more concerned about marine invasives and jellyfish blooms. Habitat destruction stands out as a concern for those visiting or living near the Baltic.

Public understanding of sea temperature change and sea level rise

To find out whether understanding among the European public is consistent with current scientific knowledge we asked a series of questions relating to two of the most common direct indicators of change in the marine environment: sea temperature change and sea level rise. The idea was to find out whether fundamental messages about climate change impacts at the coast or in the sea are being picked up.

Sea level rise

Broadly speaking, the estimates provided by the public matched expert opinion well, suggesting that some fundamental messages are reaching the public. Asked about sea level rise over the next 100 years, 40 per cent of respondents thought that waters would rise by 10cm to 1m, with a further 27 per cent saying the figure would be between 1 and 5m.

The CLAMER scientific synthesis report discusses sea level change as one of its key themes, and the figures in the 2007 Intergovernmental Panel on Climate change (IPCC) report, which expects a 19-58cm rise in sea level by end of the century, match well with the estimates provided by the general public.

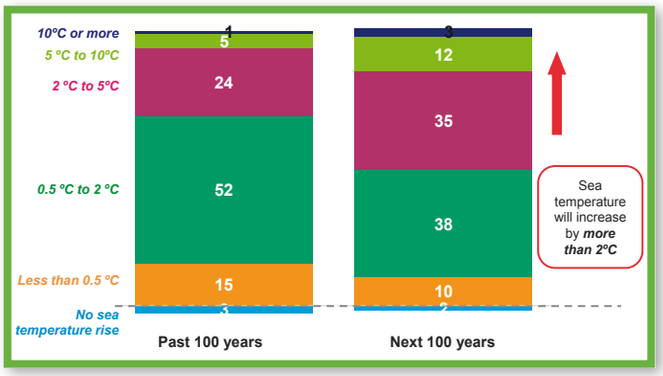
The CLAMER scientific synthesis report goes on to state that studies since the latest IPCC report was published in 2007 estimate that sea level could rise by anything up to 2m by 2100.

It therefore seems reasonable to say that given the uncertainty surrounding sea level projections the estimates provided by over two thirds of respondents match very well with what experts currently think might happen.

Sea temperature change

The general consensus amongst the public is that sea temperature has risen by less than 2°C over the past century. Looking forward to changes over the coming century, a high percentage of people expect the rise to be greater than 2°C. Both of these estimates accord well with the general scientific consensus. For example, the CLAMER scientific synthesis report states that the current trend of warming is likely to continue with increases of 2°C and more over the next 100 years.

At the country level, variations are marked. For instance, only 32 per cent of Estonians expect sea temperature rise to exceed 2°C in the next 100 years compared to 61 per cent of Spaniards.



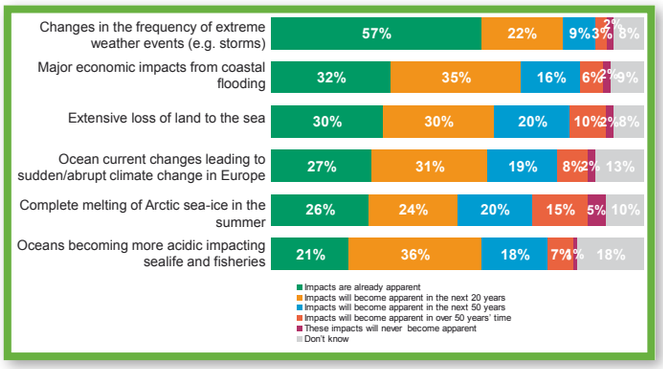
'By how much, if at all, do you think sea temperature around the coasts of [your country] has risen over the past 100 years'/'will rise over the next 100 years?' Responses from all 10 countries. (Note that for Czech respondents 'Europe' was inserted in the parentheses)

When will impacts be felt?

In order to determine the public's concept of when climate change impacts would become apparent, the respondents were asked to put a timeframe on six key impacts. For all of the issues covered, at least 50 per cent thought that impacts would become apparent in the next 20 years. When asked about 'changes in the frequency of extreme weather events (e.g. storms)', over 50 per cent thought that the impacts are already apparent.

There is a high correlation between respondents who were more 'concerned' about the impacts of climate change and how soon they thought the impacts would become apparent. Those who were highly concerned considered that they could already see these impacts.

More women than men said that impacts are already apparent for all six issues, and in general the youngest (18-24) and oldest (65+) respondents were least likely to say that impacts are already apparent.



'When, if at all, do you think the following impacts of climate change on the coastline and seas of Europe will become apparent?'

Where does the European public get its information on climate change impacts at the coast or in the sea from?

A very important area of interest to this project is how European citizens obtain information about climate change impacts at the coast or in the sea. Television dominates (82 per cent) and the Internet (56 per cent) also scores highly.

A surprisingly high percentage of respondents (29 per cent) claimed to have heard about climate change impacts on the coastline or the sea through reading scientific publications. This high percentage may be due to scientific publications being cited in other media and in articles in popular special interest magazines (e.g. National Geographic).

Looking at key demographics, 18-24 year olds are the biggest users of the internet, films and social networking sites as sources of information. Interestingly, there is a clear and steady decline in receiving information from friends and family with age, with 32 per cent of 18-24 year olds getting information in this way compared to just 14 per cent of the 65+ age group.

What underlies public understanding of coastal and marine climate change impacts?

As yet there has been relatively little research on the factors that shape public understanding of marine and coastal climate change impacts, although there is a large number of studies of public understanding of climate change in general. There is only space here to touch on some of the most important factors that influence public understanding at the individual level: personal experiences and visibility, perceptions of risk, and moral or equity concerns.

Members of the public regard sea level rise, coastal flooding, erosion and harm to wildlife as important for different reasons. According to our in-depth study, people tend to associate flooding and erosion with sea level rise, which they attribute to melting ice caps. These trends are all seen to affect human populations on land, so their dominance in the responses may be explained in terms of ***perceived risk*** to human settlements. They are relatively tangible impacts too, some of which are already *visible* and spectacular, for instance in TV images of crumbling cliffs and houses falling into the sea.

As with pollution, members of the public tend to prioritise marine climate change impacts that they themselves have *experienced or seen,* whether directly or through the local media. This is partly why visibility is so important in shaping understanding. It also means that in some cases they may perceive personal benefit in the marine impacts of climate change, as in the case of sea temperature rise in Northern Europe.

However, the importance that the public attaches to climate change impacts on marine and coastal wildlife, even in remote locations, shows that *public concern is not solely driven by self-interest.* Some people are also concerned about the impacts of climate change on traditional societies**,** Inuit populations being the most obvious example.

'I used to come to these beaches as a child. I've noticed that the beaches are dirtier, there's more stuff washing up that is clearly what people have put down toilets, that hasn't actually disintegrated.'
(Tanya)

'Every year it seems to be increasing, the amount of wave action on our coast.'
(Ralph)

For many people, climate change remains a *psychologically distant* issue. Various European social science studies indicate that people in industrialised countries tend to associate climate change with large-scale, distant and generic impacts such as melting polar ice. They also see socio-economic impacts as affecting people in developing countries rather than themselves, and in addition they see the problem as distant in time. Some environmental psychologists interpret these attitudes as forms of denial.

'I'll be honest, I quite like the idea of the sea warming, it means you can go swimming more and you don't have to wear a wetsuit as much. Sounds good to me!'
(Zahra)

You've got melting sea ice, all the polar bears are suffering and also the Inuits, those sort of people who have the smallest carbon footprint, these indigenous people. But they have the biggest ramifications from melting sea ice and global warming, although really they have nothing to do with it.
(Adrian)

'It's things you read in the papers, things you see on TV; and that's big stuff and difficult to get your head around!' (Don)

'I think changes in the thermohaline circulation is a gradual change and if it does happen, it could be a hundred years. Hopefully it doesn't affect us!' (Ralph)

Ocean acidification is a good example of a *psychologically distant* marine climate change impact. The CLAMER survey shows that currently few people have heard of ocean acidification. But even when they are made aware of it they tend to regard it as a remote and highly scientific problem without relevance in their own lives.

'Acidification is more to do with marine life, isn't it? So I'd be more worried about my house than a fish... the acidity of the sea is not going to be harmful to a person or their property.' (Michael)

Risk perceptions of sea level rise and flooding

Even where there are already tangible and fairly immediate local implications, people still find it hard to make a personal connection with the impacts of marine climate change. For instance, people living in high risk areas seldom see themselves as personally at risk from sea level rise and associated coastal flooding. What makes a difference is prior local experience of flooding, in such situations the converse seems to be true and people may actually overestimate the risk.

'We've just moved to a house close to the sea – we just didn't consider the risk of flooding.' (Marion)

What media sources do the public trust?

Much has been written in recent years about whether or not the public trusts different forms of media to present science accurately and responsibly.

There has been some sensational reporting in newspapers and on television. In the context of climate change, scientists have voiced their concern that results and conclusions have been misrepresented, especially in the news media, to make the consequences seem more catastrophic and the timescale shorter.

As part of the CLAMER survey, participants were asked to indicate their level of trust or distrust in different types of media (television, broadsheet newspapers, tabloid newspapers, magazines, radio, the Internet, social networking sites, blogs, films, books and scientific publications) on a 5-point scale ranging from 5 (trust a lot), to 1 (distrust a lot).

Key findings include:

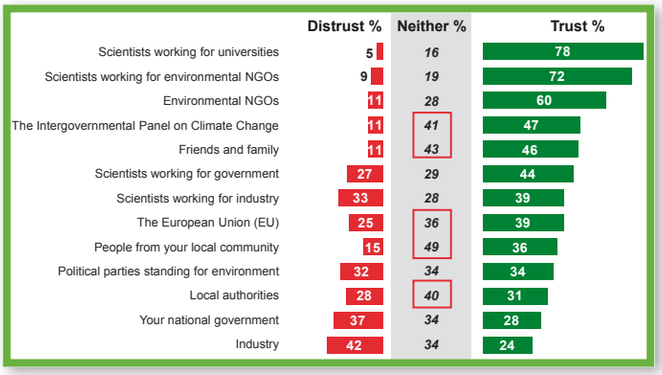
- Of all the information sources suggested to participants, trust in scientific publications was particularly high (83 per cent of respondents for the combined categories 'trust a lot' and 'trust a little'), even though only 29 per cent of respondents claimed to receive information about the impacts of climate change on the coastline or the sea through this medium.
- Tabloid newspapers were trusted by 23 per cent of respondents (the lowest score for trust) and distrusted by 43 per cent (the highest for mistrust). Broadsheet newspapers scored significantly better (trusted by 66 per cent, distrusted by 10 per cent).
- Of the information sources used most often by members of the public, television channels were trusted to provide an accurate depiction of marine climate change issues by 60 per cent of the populace, and were distrusted by 14 per cent.
- The Internet was trusted by 52 per cent; however blogs and social-networking sites were trusted less (20 and 24 per cent respectively) than the Internet as a whole.
- More men than women reported distrusting all media types: for example 46 per cent of men expressed distrust of tabloid newspapers compared to 41 per cent of women. By contrast, 65 per cent of women reported that they trusted what they learnt from television compared to 54 per cent of men.
- Younger people (age group 18-24) typically distrusted the Internet, blogs and social-networking sites more than older people.
- People living in coastal areas trust most sources of information on marine climate change issues more than those living inland do.

Which individuals or organisations do the public trust?

'Newspapers have their own agendas, depending on the owners.' (Marion)

It's far worse than we think it is. All the news bulletins you get, when they go to the North Pole and see the melting icecaps, they can't believe it's happened so quickly. I think we're being fooled into thinking it's not as bad as it is.' (Bill)

With regard to trust in *individuals and organizations*, scientists working in research institutes or for NGOs are clearly the most trusted groups, along with NGOs themselves. Industry and local and national government did not score highly, and when scientists were associated with either, trust was far lower than for university scientists or those linked to NGOs. While the EU did not rank highly overall it fared better than other political or government bodies.



'To what extent, if at all, do you trust each of the following individuals or organisations when providing information about climate change impacts on the coastline or the sea?'

Looking at key demographics reveals some marked differences between groups, especially regarding 'distrust': men distrust all the organizations and individuals listed more than women do, and in almost all cases, people over 35 expressed more distrust than those aged between 18 and 34.

Are there national differences in who the public trust?

There are a number of differences across the countries studied regarding both information sources and trust:

- Estonian, and to a lesser extent German and Irish respondents, trust television most as a source of marine climate change information. French respondents trust television the least.
- Trust in the Internet for information on climate change is highest in the Czech Republic (81 per cent usage and 65 per cent trust) and Estonia (74 per cent usage and 62 per cent trust). Although fewer people use the Internet as a source of information about climate change in Italy, trust is very high at 70 per cent.
- Trust in all sources of information except television, radio and film is higher in Italy than in any of the other countries. Distrust in the Internet is highest in France (27 per cent). Tabloid newspapers are particularly distrusted in France (76 per cent), Netherlands (72 per cent), Estonia (71 per cent) and the Czech Republic (73 per cent).
- Broadsheet newspapers enjoy high levels of trust across all countries surveyed; distrust in this source is highest in the UK (16 per cent) and Norway (15 per cent).

Distrust in industry is as high as 61 per cent in Germany but only 21 per cent in France. This pattern extends to scientists working in industry, with 50 per cent distrusting these in Germany but only 15 per cent in France. German citizens also expressed the highest level of distrust (35 per cent) in government scientists. Dutch and Norwegian respondents trust environmental NGOs the least (43 per cent and 46 per cent), whereas Italians trust them most (71 per cent).

Citizens of the Czech Republic and Ireland are most likely to distrust their national governments and the Dutch and Norwegians are least likely to do so. Finally, respondents from the UK and Germany are most likely to distrust the EU, while levels of distrust of the EU are lowest amongst Italian respondents.

'Research is dependent on where the funding is coming from.' (Simone)

'You've got to be healthily sceptical of what people put in front of you.' (Carrie)

'Peer review journals are probably more accurate, but maybe in ten years' time they'll say: 'That's not right, we've changed our minds about it'. You can only go on what they believe at the moment, but it is often contradicted later.' (Adrian)

Which individual-level actions do people think are effective in relation to climate change, and which of these are they already putting into practice?

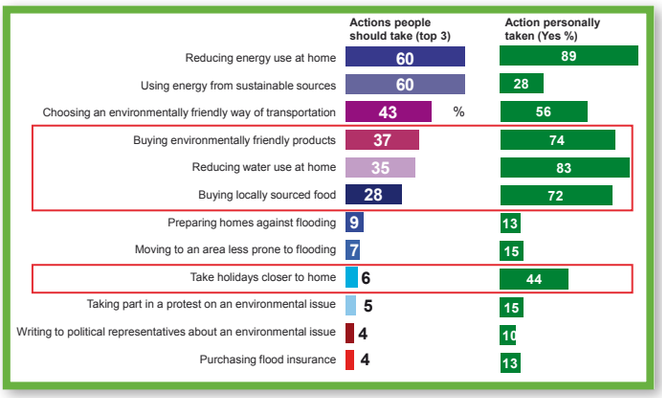
'Financial first, then environmental...the main thing I've done: three minute showers. I timed myself with a kitchen timer and that knocked £100 off the water bill.' (Joseph)

'I don't use the car much. It's fuel costs, but I also feel I'm contributing.' (Daniel)

CLAMER survey respondents were asked which of a list of actions they see as being effective in mitigating and adapting to climate change. In a separate question they were asked which of these actions they are doing themselves:

- Cost was an important factor in people's choices. For instance, although 89 per cent of people suggests that they have reduced their domestic energy consumption, only 60 per cent thought this effective in relation to mitigating climate change.
- While 28 per cent used energy from sustainable sources, 60 per cent saw this as effective in mitigating and adapting to climate change. This may be due to the higher cost of energy from sustainable sources or to lack of access to such energy.
- Although cost considerations are important with regard to some actions, they cannot explain why so many people buy environmentally friendly products and locally sourced food, which are often more expensive than the alternatives. This suggests that many people are trying to live more sustainable lives, although they do not see this in terms of climate change.

Relatively few people think that adapting to the climate change impacts of sea level rise and associated flooding is effective or are taking such actions themselves. Some social scientists argue that climate change adaptation has to be triggered by perception of risk. Before they take action to adapt, for instance by protecting their homes against flooding, people must believe that they are personally capable of taking the required action and that the action they have in mind will be effective.



'Select the three most effective actions individuals should take to reduce and cope with the impacts of climate change' and 'Have you taken any of the following actions to reduce and cope with the impacts of climate change'

'Personally I think the whole concept and term "climate change" is wrong and we need to go back to basics in terms of what the environment is and what we need to do with it.' (Joseph)

What does the social sciences literature tell us?

A review of relevant social science studies and the CLAMER in-depth study show that:

- Individuals often underestimate their own contribution to carbon emissions, preferring to blame other groups of people or other nations.
- There is a tendency for people to see mitigating climate change as the responsibility of industry and governments rather than themselves.

People also tend to see adaptation to climate change impacts such as flooding as the responsibility of government at various levels.

- Expectations that it is up to governments, or in some cases the private sector, to take action may be linked to feelings of personal powerlessness. People commonly think that any mitigatory action on their part such as energy conservation would have such a negligible effect as to be futile.
- As well as psychological barriers there are also external barriers to individual change. For instance, absent or inadequate public transport services make it hard for individuals to give up using their car, even though they may be aware that they are harming the environment.
- Some social scientists argue that governments sustain economic institutions and ways of life that cause and exacerbate climate change, and that this should be the focus of efforts to mitigate climate change rather than individuals' understanding and behaviour.

'Well, personally I do my best but it's a drop in the ocean!' (Tanya)

'I'm conscious about some of the issues, but I can't see how I can actually do something to affect them personally, like I can't change coastal erosion; I can't change the water levels.' (Michael)

'I just think everybody should do their bit, however small it is.' (Barbara)

Policy and Research priorities... the public's view

In the final section of the survey respondents were asked to choose from a list of marine and climate change policy areas that they thought the EU should prioritise.

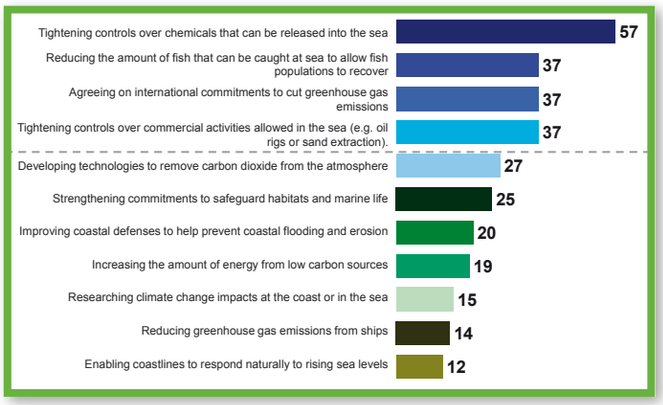
EU climate change and marine policies

When given a list of possible priorities for EU marine and climate change policies and asked to choose their top three, by far the most popular choice was the tightening of controls on chemicals released into the sea, which is not directly related to climate change. Furthermore, two of the other top responses (limiting fishing and commercial activities in the sea), were not directly related to climate change either.

The climate change issues that were ranked highest, especially by the youngest (18-24 age group), involve climate change mitigation through either limiting emissions via international agreements or actively removing CO_2 from the atmosphere, with research into the impacts of climate change at the coast or in the sea coming near the bottom of the list.

Adaptation measures relating to managing the coastline through defences or by allowing the coast to respond naturally to change also ranked relatively low, even amongst people living near to the coast.

It should be noted that improving coastal defences was regarded as a relatively high priority in several countries, namely the UK (32 per cent) and the Netherlands (28 per cent), and in these countries coastal dwellers ranked this markedly higher. In Norway and Spain improving coastal defences was only included in the top 3 issues by 10 per cent of respondents (or less).



If you had to decide what climate change and marine policies should be prioritised by the European Union, which three would you select from this list?

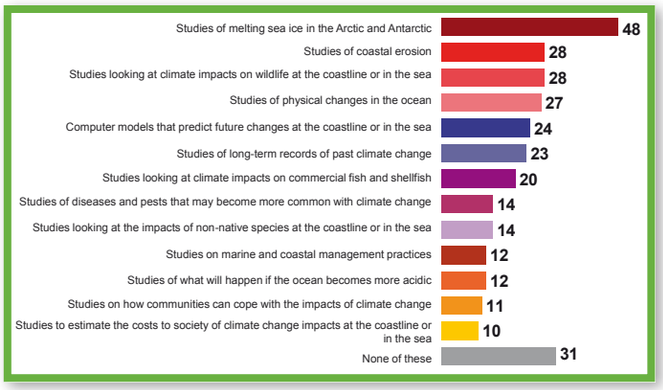
Awareness of research themes

The survey also investigated awareness of key areas of EU research concerning climate change impacts at the coast or in the sea, and asked respondents to prioritise these.

A review of the CLAMER inventory of relevant EU research programmes identified 13 broad research areas that have received a significant amount of EU funding over the past five years.

Respondents were most aware of studies of melting sea ice, with 50 per cent of the total sample claiming to have heard of such research. More generally, studies related to the physical impacts of climate change, with the exception of ocean acidification, scored more highly than social and economic research.

At the country level, stated awareness of the 13 research themes was highest in Italy, Spain and the Czech Republic and lowest in the UK, Netherlands and Norway. Almost half of the UK respondents said that they had not heard about any of the research themes listed.



Which of the following research themes that the EU is currently funding into climate change impacts at the coastline or in the sea have you heard about?

'There's all this amazing scientific research being done, but unless that's disseminated to the general population, people can't respond properly.' (Carrie)

(Results for all 10 countries surveyed)

Research priorities

In the respondents' research priority ranking there is a clear link between the research themes that people are most aware of and the three research themes that they would like to see prioritised.

Research into melting sea ice comes out top in all countries apart from Estonia. Some issues, such as the impact of climate change on diseases, pests or non-native species, are seen as high priority despite limited awareness of these subjects. The standout exception to this rule is coastal erosion, which is low on the list of priorities despite the public's relatively high awareness of it. However, it should be noted that this is less marked amongst people living near the coast.

Where social and economic impacts are concerned there is much more support for policies that help communities to cope with climate change than for those that focus only on its economic cost to society.

With regard to demographics, studies looking at wildlife, pests and diseases and how human communities can cope with climate change are more important to women than to men. A higher proportion of men see computer climate modelling, studying past records and estimating the cost of climate change to society as priority areas for research.

The most obvious age-based difference is that coastal erosion studies are seen as more of a priority by older age groups. Conversely, a higher proportion of younger people considered that estimating the economic costs to society should be a priority research area.

Key country differences in research awareness and priorities:

- Studies of physical changes feature most prominently in Estonia.
- The importance of research related to impacts on wildlife was seen as particularly important in Spain but much less so in the Netherlands, a fact that strongly reflects the much higher stated awareness of this issue in Spain.
- Studies of pests and diseases are regarded as more important by Estonians, the French and the Spanish, while studies of the socio-economic impacts of climate change on coastal communities are regarded as being particularly important to Norwegians.
- Coastal erosion is seen as a priority by respondents in the UK and Ireland more than in other countries.
- Respondents in the Czech Republic appear to be very concerned about climate change impacts on fish and shellfish, especially when compared to Estonians.
- Citizens of Germany regard studying long-term records of climate change as more important than other countries, especially Spain, do.
- Studies on marine and coastal management practices are more important to the Dutch than to all the other nations surveyed
- Norwegians rank the importance of studies of non-native species higher than any other country.

	Priority	Awareness
Studies of melting sea ice in the Arctic and Antarctic	**1**	**1**
Studies of physical changes in the ocean (e.g. ocean currents, storms and waves)	**2**	**3**
Studies looking at climate impacts on wildlife at the coastline or in the sea	**3**	**2**
Studies of diseases and pests that may become more common with climate change	**4**	**7**
Studies on how communities can cope with the impacts of climate change	**5**	**9**
Studies of coastal erosion	**6**	**2**
Studies of what will happen if the ocean becomes more acidic	**7**	**8**
Computer models that predict future changes at the coastline or in the sea	**8**	**4**
Studies looking at climate change impacts on commercial fish and shellfish	**9**	**6**
Studies of long-term records of past climate change	**10**	**5**
Studies of marine and coastal management practices	**11**	**8**
Studies to estimate the costs to society of climate change impacts at the coastline or in the sea	**12**	**10**
Studies looking at the impacts of non-native species at the coastline or in the sea	**13**	**7**

Comparison of ranking for 'Which of these research themes that the EU is currently funding into climate change impacts at the coastline or in the sea have you heard about?' and 'If you had to decide what research into climate change impacts at the coastline or in the sea should be prioritised in the future by the European Union, which three would you choose from the list below?'

Communicating EU marine science to the public

Over the past decade, public understanding of science and scientific issues has received increasing attention, with numerous books aiming to teach scientists how to relate information in a way that is both entertaining and enlightening.

The outreach activities of 64 EU and national research projects with a focus on marine climate change issues were examined to determine and highlight examples of good practice, innovation and success in communicating with the public.

Most EU projects include some sort of information campaign, although this is rarely an integral part of the wider programme of work. In the majority of cases outreach does not extend beyond a one-way transfer of knowledge through project websites, factsheets or scientific papers. However, about a quarter of the projects have generated media interest through articles in newspapers or magazines or through television and radio.

In recent years more imaginative ways of engaging the public have started to emerge. These have included public expeditions accompanied by ongoing and regularly updated web blogs or Twitter feeds, exhibitions, art installations and events for schoolchildren. Many recent EU research projects have produced explanatory videos or films making use of online video repositories such as YouTube.

Never before has it been easier for interested members of the public to gain access to information about scientific research, or for scientists to communicate directly with the public.

There are many different 'publics' differentiated by age, sex, nationality and level of education. Tailored messages and wider understanding of difficult scientific issues are needed if outreach strategies are ever to be successful. Often policy makers and scientists underestimate the level of knowledge or interest among the European populace.

There is evidence that, to engage the public, the most effective messages combine authoritative scientific information about climate impacts on a local scale with simple advice on how to respond. Future attempts to involve European citizens need to start from knowledge of how they already understand, experience and engage with marine climate change issues in their own terms.

Citizen Science

An increasingly popular approach has come to be known as 'citizen science' where members of the public are actively involved in data gathering or analysis. Well known examples include projects that utilise home computer power when networked PCs are sitting idle, e.g. SETI@home with 5.2 million participants worldwide (this project analyses radio signals to search for signs of extra terrestrial intelligence).

Projects focused on climate change or the marine environment specifically include "Climateprediction.net" (or CPDN), a 'distributed computing' project that aims to investigate and reduce uncertainties in global climate modelling, and the 'OldWeather' initiative that is aimed at recovering maritime weather observations in the United Kingdom made by naval ships during World War I.

The "CLIWOC" initiative aimed to recover worldwide maritime weather observations made by historic sailing ships from France, Netherlands, Spain and the UK during the period 1750-1850, including vessels on both sides during the Battle of Trafalgar.

A number of schemes are operating that make use of sporadic observations of particular marine organisms in European waters. These initiatives make extensive use of members of the public and tend to focus on sightings or strandings of unusual and 'charismatic' species such as whales, ocean sunfish *Mola mola*, sea turtles and seahorses. They offer a useful service by summarising records that would otherwise be lost to the scientific community.

CLAMER Project Partners

Royal Netherlands Institute for Sea Research (NIOZ)

Marine Board- European Science Foundation (ESF-MB)

Centre for Environment, Fisheries and Aquaculture Science (CEFAS)

Flanders Marine Institute (VLIZ)

University of East Anglia (UEA)

University of Brest (UBO-IUEM)

Danish Meteorological Institute (DMI)

Plymouth Marine Laboratory (PML)

National University of Ireland - Galway (NUI)

Natural Environment Research Council - NERC (NOC-NERC)

Spanish Council for Scientific Research (CSIC)

Hellenic Centre for Marine Research (HCMR)

Océanopolis (SOPAB)

University of Tromso (UoT)

Netherlands Institute of Ecology - KNAW (NIOO-KNAW)

Marche Polytechnic University (UNIVPM)

Sir Alister Hardy Foundation for Ocean Science (SAHFOS)

What is CLAMER?

CLAMER (Climate Change and Marine Ecosystem Research) is a European Union 7th Framework Programme project involving 17 marine research institutes and universities in 11 European countries. The project builds upon the widely-held perception that there is a gap between what is known through research into the effects of climate change on the oceans and what policy makers and the public know and understand. The CLAMER objectives can be summarized as follows:

- To assess and summarize scientific research results and evidence on public perception of EU research into climate change impacts on the marine environment, including the socio-economic consequences;
- To organize an international conference in 2011 to disseminate and build on EU research results related to climate change impacts on the marine environment and public perceptions;
- To organize outreach events and activities to obtain wide and balanced information and participation on these matters from affected European countries and beyond.

Polling in the Republic of Ireland

The extension of the CLAMER polling to include the Republic of Ireland was co-sponsored by the Marine Institute, the Environmental Protection Agency and Heritage Council of Ireland

Other CLAMER products:

Documentary: *'Living With a Warming Ocean'*

This CLAMER documentary about impacts and perceptions of climate change in European marine environments is directed by Com on Planet and sub-contracted by Océanopolis. This high-definition quality film is formatted for international television and is available on DVD and to download from the CLAMER website at **www.clamer.eu**.

Book: *Climate Change & European Marine Ecosystem Research*

The book based on the project has been edited by SAHFOS and CSIC and includes illustrations by the artist Glynn Gorick. The structure of the book is based on 12 topics and presents an overview of the results of major research on the effects of climate change in the European marine environment.

Further details and contacts

For further details about the work of CLAMER go to **www.clamer.eu**

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