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www.clamer.eu

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*Advance interviews are available. The CLAMER research synthesis and survey of Europeans are available for media preview at <http://bit.ly/pPjA4d>. Audio clips: <http://bit.ly/oXVcNK>.*

# **EU Research Synthesis Warns Major Threats Loom Due to Changing Oceans; Sea Levels, Erosion Top Public Concerns**

*Scientists distill conclusions from 13 years of European research  
on climate change and marine environments;*

*Groundbreaking companion poll of Europeans reveals  
depth of public knowledge, concern*

Europeans face greater risk of illness, property damage and job losses because of the impacts of climate change on the seas around them.

Worried citizens, whose biggest related top-of-mind concerns are sea level rise and coastal erosion, are taking personal actions to reduce carbon emissions. However, they largely blame climate change on other groups of people or nations and assign governments and industry responsibility for mitigating the problem (though they perceive government and industry as ineffective on the issue).

Those are among the conclusions after scientists synthesized an extensive collection of academic papers published since 1998 on climate change and Europe's marine environments, combined with a groundbreaking companion poll of Europeans on the issues, commissioned as part of Project CLAMER, a collaboration of 17 European marine institutes.

The 200-page synthesis of more than 100 EU-funded projects, the public survey, a new book based on the scientific findings, and a major new documentary film will be featured at CLAMER's wrap-up meeting Sept. 14-15 in Brussels.

The research distillation captures a suite of documented and forecast physical, chemical and biological marine changes with far-reaching consequences, including sea-level rise, coastal erosion, melting ice, storm frequency and intensity, physical changes including the North Atlantic circulation system, chemical changes such as acidification and deoxygenation, changes in marine life patterns, and the ultimate impacts of all this on humans – both social and economic.

“We have amassed convincing and disturbing scientific evidence,” says CLAMER co-ordinator Carlo Heip, Director of the Royal Netherlands Institute for Sea Research. “We need to communicate it much better than we have. We must all heed the clear warnings of the hazards we face from what amounts to an uncontrolled experiment on the marine environment.”

Co-ordinated by the Marine Board of the European Science Foundation, with contributions from more than 20 scientists, the CLAMER synthesis and related book, both available to the public Sept. 13 at [www.clamer.eu](http://www.clamer.eu), examine the environments of the North Sea, Baltic Sea, Arctic Ocean, North- East Atlantic Ocean, Mediterranean Sea and the Black Sea.

The synthesis notes that it is difficult to predict precisely the impacts of climate change or attach cost estimates to them. As well, some impacts will be widespread while others will vary from place to place.

That said, the societal impacts forecast include:

### **Rising illness risk**

Says the CLAMER synthesis: “Millions of euros in health costs may result from human consumption of contaminated seafood, ingestion of water-borne pathogens, and, to a lesser degree, through direct occupational or recreational exposure to marine diseases. Climatic conditions are playing an increasingly important role in the transmission of these diseases.”

More specifically, a team of researchers from Italy, the UK, Germany and the USA recently found, for example, that warmer ocean water is causing a proliferation of bacteria from a genus known as *Vibrio*, among the most dangerous of all bacterial pathogens, which can produce serious gastroenteritis, septicemia and cholera.

Some types of the bacteria and micro-algae are linked to shellfish-associated food poisoning deaths. Others harm marine animals, including mollusks and fish, “with major economic and environmental impacts,” the researchers say.

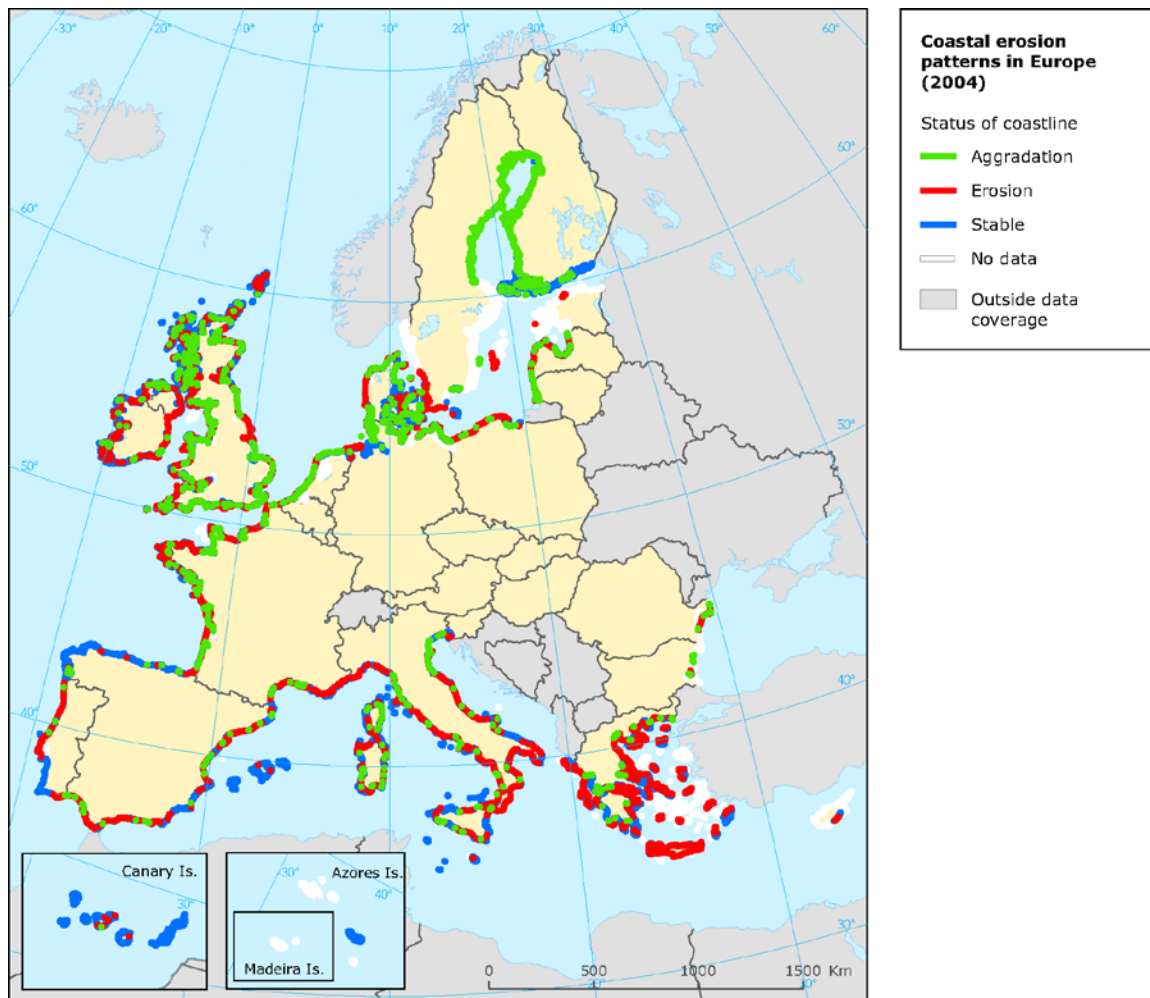
Published in July in the Journal of the International Society for Microbial Ecology, the paper reports “an unprecedented increase in the number of bathing infections that have

been associated with warm-water *Vibrio* species in Northwest Europe,” and a “globally-increasing trend in their associated diseases.”

While the study was based on seawater samples taken near the mouth of Europe’s Rhine River and Britain’s Humber River, “the increasing dominance of marine *Vibrios*, including pathogenic bacterial species, may very likely occur in other areas around the world.”

Says the paper: “We provide evidence that *Vibrios*, including the (cholera) species, increased in dominance within the plankton-associated bacterial community of the North Sea during the past 44 years and that this increase is correlated significantly with climate induced sea surface warming during the same period. ... Ocean warming is favouring the spread of *Vibrios*.”

### Property damage



Source: European Environment Agency (EEA), based on EU EuroSION project data

Sea level rise, combined with higher waves being recorded in the North Atlantic and more frequent and severe storms, threaten up to 1 trillion Euros worth of Europe's physical assets within 500 m of the shore. And some 35% of Europe's GDP is generated within 50 km, the synthesis notes.

“Sea-level rise of 80 to 200 cm could wipe out entire countries ... causing sea floods, massive economic damage, large movements of populations from inundated areas, salinity intrusion and loss of wetlands including the ecosystem services that they provide.”

More frequent and intense storms, meanwhile, are projected for Northern Europe, especially in a band running from the south of England through northern France, Denmark, northern Germany and Eastern Europe. Annual damages are expected to rise 21% in the UK, 37% in Germany and 44% across Europe as a whole, with a 104% rise in losses from 1-in-100 year storms.

### **Smaller fisheries and northward fish migrations**

The CLAMER synthesis suggests the need for Europe's commercial fishery to reduce catches in places and make adjustments in others due to warming water, ocean acidification, and altered salinity and oxygen content.

“Some of the biggest [changes] will be required in Europe's seas, where temperatures are rising faster than the open North Atlantic,” according to one research paper in the CLAMER collection.

Another warns of possible extinction of cod stocks in the Baltic Sea and calls for “a strategy ... to ensure the persistence of Baltic cod into the twenty-second century.”

In the Mediterranean Sea, the catch of *Aristeus antennatus* ([www.eol.org/pages/347714](http://www.eol.org/pages/347714)), a valuable shrimp, may experience “a true collapse” as changes in sea temperatures dramatically reduce, or even stop, the transfer of nutrients to deep waters.

Ominously, the biggest reductions in fish populations are forecast for low-latitude regions, many of which are already impoverished and face the greatest loss of agricultural production due to increased drought and storms. Researchers say the northern migration of some fish species poses a serious food security threat for poorer tropical countries where fish often constitute the largest source of protein.

The global pattern will apply to Europe, with the southern fisheries generally losing productivity while those in the north such as Greenland, Iceland and Norway are expected to gain.

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With respect to the northward shift of fish species, the CLAMER synthesis notes one of the largest ever observed: the dramatic spread of the snake pipefish (*Entelurus aequoreus* – [www.eol.org/pages/223062](http://www.eol.org/pages/223062)). Prior to 2003, the fish was confined to the south and west of the British Isles. It now extends as far north as the Barents Sea and Spitzbergen, about 3,000 km to the north.

## **European attitudes toward climate change and the marine environment**

The online survey of 10,000 residents of 10 European countries -- 1,000 from each of Spain, Italy, Germany, France, Czech Republic, Netherlands, Ireland, United Kingdom, Norway and Estonia -- reveals widespread concern about climate change, led by worries about sea level rise and coastal erosion.

Conducted in January by Brussels-based TNS Opinion, the survey, available to the public Sept. 13 at [www.clamer.eu](http://www.clamer.eu), is the first of its kind to focus on public perceptions of climate change impacts at the coast or in the sea. The poll findings are further explained by in-depth research, carried out by UEA, that involved UK public participants in group discussions.

### **Highlights:**

\* Asked to select from a list the single most serious problem facing the world, 18% of respondents chose climate change, the second highest choice. By comparison, poverty and lack of food and drinking water was chosen by 31%, international terrorism by 16%, and a global economic downturn by 12%.

- \* Concern about climate change is undiminished since a Sept. 2009 “Euro-Barometer” survey conducted for the European Union, despite the cool winter of 2010 in Northern Europe and “climategate” attacks on the IPCC and climate scientists.
- \* Some 86% of respondents said climate change is caused entirely, mainly or in part by human activities. Only 8% thought it was mainly or entirely caused by natural processes; in the United States, around 32-36% hold this view.
- \* Asked to name in their own words “an important environmental issue of relevance to the coastline or sea,” only 4% of respondents used the words “climate change,” with most citing pollution or overfishing. However, several climate change-related impacts were frequently mentioned, notably coastal erosion, sea level rise, melting ice caps and flooding. Coastal erosion and/or sea level rise and/or climate change were cited by 24% and 27% of Irish and UK respondents respectively.
- \* Asked to comment on a list of 15 environmental issues related to the coasts or seas, respondents from all 10 countries said they had the greatest confidence in their understanding of, and were most concerned about, coastal pollution, over-fishing and melting sea ice. In last place, only 14% said they were informed about acidification of the oceans. However, nearly 60% expressed concern about that issue.
- \* Italian respondents claimed the greatest concern about issues on the list; those from Norway, the Netherlands and Estonia, the least.
- \* Not surprisingly, respondents living near the sea claimed more understanding and concern about all 15 issues than those further inland. But in an apparent paradox, Italy, the most southerly of the 10 countries, expressed the most concern about melting Arctic sea ice while Norway, the most northerly, voiced the least concern.
- \* Surprisingly, citizens of the low-lying Netherlands worry less about inundation than the 10-nation average (61% of Dutch survey participants cited sea level rise and coastal flooding as concerns compared with 70% across all 10 countries). Meanwhile, Dutch participants trusted their government to deal with climate change adaptation issues more than citizens of the other countries studied. And, compared with all other countries, a lower proportion of Dutch respondents foresaw “major economic impacts from coastal flooding” within the next 20 years.
- \* The in-depth research complimenting the survey explains that public concern and awareness depends on the extent to which issues are visible, subject to personal experience, or pose a direct threat to human populations. More remote and distant impacts are shown to be of little relevance to people’s lives (such as ocean acidification). Even where there are already tangible and fairly immediate local implications, people still find it hard to make a personal connection with many marine climate change impacts. For instance, even people living in high risk areas seldom see themselves as personally at risk from sea level rise and associated coastal flooding.

\* Asked when they thought particular climate change impacts would become apparent, over half of respondents in all 10 countries said ‘changes in the frequency of extreme weather events (e.g. storms),’ are already being felt.

\* The poll found a high correlation between respondents who said they are more “concerned” about the impacts of climate change and those who said they think its impacts will come fairly soon. Those who declared themselves “highly concerned” tended to think they could already see these impacts happening. Females were more likely than males to say that impacts are already apparent and, in general, those under 24 and older than 65 were least likely to say that impacts are already apparent.

\* Respondents’ estimates of sea level rise and temperature change were generally in accord with scientific forecasts, suggesting “some fundamental messages are reaching the public,” the survey report says. Citizens were able to accurately characterize changes in sea temperature that have occurred over the past 100 years, and they gave realistic predictions of anticipated sea temperature change as well as sea level rise in this century.

\* Scientists working in universities or for environmental NGOs are trusted as a source of information about climate change impacts in the seas and ocean far more than government scientists or those working for industry. Men distrust all of 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.

\* Personal actions taken by European citizens in response to marine climate change issues are shown to focus more on mitigating climate change (such as reducing energy use and using sustainable forms of transport) than adapting to its impacts (through protecting homes from flooding for example).

\* Public support for actions by national governments and the European Union is shown to be highest for policies to protect and enhance marine environments (for example through tightening controls on pollution) and reducing carbon emissions, while measures to adapt to the impacts of climate change are ranked the lowest.

The poll was commissioned as part of the CLAMER programme by the Marine Climate Change Centre (MC<sup>3</sup>) at Cefas, the University of East Anglia and the Consejo Superior de Investigaciones Científicas. Inclusion of respondents in the Republic of Ireland was co-sponsored by the Marine Institute, the Environment Protection Agency and the Heritage Council of Ireland.

\* \* \* \* \*

## **Project CLAMER partners**

### **Marine Board – European Science Foundation**

#### **Netherlands**

Royal Netherlands Institute for Sea Research (NIOZ)  
Royal Netherlands Academy of Arts and Sciences

#### **Belgium**

Flanders Marine Institute

#### **United Kingdom**

Sir Alister Hardy Foundation for Ocean Science  
Centre for Environment, Fisheries and Aquaculture Science  
Natural Environment Research Council  
Plymouth Marine Laboratory  
University of East Anglia

#### **France**

Océanopolis  
University of Brest

#### **Denmark**

Danish Meteorological Institute

#### **Italy**

Università Politecnica delle Marche

#### **Greece**

Hellenic Centre for Marine Research

#### **Ireland**

National University of Ireland – Galway

#### **Spain**

Spanish Council for Scientific Research

#### **Norway**

University of Tromsø

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## **Project CLAMER, concluding conference programme** *Royal Flemish Academy of Belgium for Science and the Arts, Brussels*

### **Wednesday, 14 September 2011**

**18:30**

Registration

**19:20**

Welcome and introduction to CLAMER, presentation of the CLAMER book  
*Dr. Carlo Heip (Project CLAMER coordinator, and Director, NIOZ)*

**19:30**

Iceland, a land of fire, ice and climate change  
*Dr. Katja Philippart (Project CLAMER coordinator, NIOZ)*

**20:30**

Première of the CLAMER documentary “Living with a warming ocean”, introduced by producer  
*Mr. Jean-Yves Collet (ComOnPlanet)*

**21:30**

Reception

### **Thursday, 15 September 2011**

**08:00**

Registration

**09:00**

Welcome and introduction to CLAMER  
*Dr. Katja Philippart & Mr. Quentin Cooper (Conference chair, science journalist, BBC Radio)*

**09:10**

Overview of European research on climate and marine environment  
*Ms. Manuela Soares (Director Environment, DG Research & Innovation, European Commission)*

**09:25**

Climate change impacts on marine ecosystems in Europe  
*Prof. Dr. Carlo Heip (Project coordinator, NIOZ)*

**10:00**

IPCC, climate change research and the marine environment  
*Dr. Rajendra K. Pachauri (Chair, Intergovernmental Panel on Climate Change (IPCC) - video message)*  
*Prof. dr. Jean-Pascal van Ypersele (Professor, Université catholique de Louvain, and Vice-Chair, IPCC)*

**10:30**

Coffee/tea break

**11:00**

Outcomes of the first pan-European poll on public perception and awareness of climate change impacts on the marine environment

*Mr. Paul Buckley (CEFAS)*

**11:25**

Exploring public understanding of, and responses to, marine climate change

*Dr. Jason Chilvers & Ms. Geraldine Terry (University of East Anglia)*

**11:50**

'Testing the water' – Raising awareness of our changing seas

*Dr. Jan Mees (Flanders Marine Institute - VLIZ) & winner of video message contest*

**12:20**

Morning session wrap up

**12:40**

Media availability session

**13:45**

Science for society: linking marine and climate change research with policy

*Dr. Sybille van den Hove (MEDIAN)*

**14:00**

All aboard: getting climate change research to chime with the wider public

*Mr. Quentin Cooper*

**14:15**

Nine parallel workshops

- 1) Climate change impacts and European marine policies
- 2) Understanding public understanding: the implications of CLAMER public perception findings for marine scientists and policy makers
- 3) Organisation of the European marine climate research community and agendas in the future

**16:15**

Plenary discussion on workshop output

**17:00**

Reception

*In addition to the conference and related written and video materials, educational events were organized by Project CLAMER in 34 European aquaria and marine institutes throughout the summer of 2011.*