

## PREFACE BY THE PROJECT COORDINATORS

Climate change has become a household word in Europe, but its consequences for the day-to-day life of European citizens are not yet fully appreciated, let alone are people changing their behaviour in anticipation of what is coming. At the political level, the EU and its member states have been actively engaged in developing EU policies and in negotiating the climate conventions at the global scale, but with limited success as the outcome of the Copenhagen Climate Conference in 2009 has shown. One of the reasons for the apparent knowledge gap and the consequent public and political ignorance, indifference or even hostility in many countries worldwide, is that climate change operates slowly and erratically, at time scales that are very different from the economic and political reality, and from the perception of the public. Trends rather than events are what matter, but one cold winter in a particular country is enough to create doubt about the reality of climate change.

The public and political debate on climate change heavily relies on science. This puts an immense responsibility on scientists and requires impartial, objective and excellent science. Things have not become easier since the scientific credibility of the Intergovernmental Panel on Climate Change has been undermined in the popular press. So-called Climate Sceptics, sometimes scientists themselves, are given the floor in the public debate by the media, creating confusion of the scientific point of view that climate change is a reality, a view that is upheld by a very large majority of serious scientists and by nearly all the specialists in the field. The debate on climate change therefore still needs input from science as one of the essential elements.

The possible consequences of climate change are immense and require information and debate by the general public. This holds especially for the impacts of climate change on the marine environment. Despite the fact that the seas and oceans around Europe are vast and diverse, and form an important part of the European territory, most people only experience the beaches and, at best, have a theoretical knowledge about the fact that the climate and weather patterns in Europe are dominated by what happens in the ocean. Even sea-level rise, as one of the most dramatic direct consequences of climate change for some countries, occurs too slowly to really frighten people even in the most affected countries, such as the Netherlands.

But the oceans are changing, and in some cases changing far more rapidly than we thought was possible only a decade ago. The rapidly and ever increasing CO<sub>2</sub> concentrations in the atmosphere have warmed up at least the upper 2 km of the oceans. Subtle consequences of that are increased stratification, leading to diminishing productivity, and a slow but steady loss of oxygen from deeper waters, with devastating effects on the deeper water biota. The acidity of the oceans is increasing with consequences that are still largely unknown. Species are changing their distributions, in general moving northward everywhere, from the North Sea to the Barents Sea, from the Mediterranean to the Black Sea and so on. Fishermen, seals and birds alike will have to follow their favourite catches.

Within the CLAMER project, a group of distinguished marine scientists was invited to summarise the state of knowledge on the issue, especially as based on the results of EU funded research. The EU has been an important international sponsor of climate research with its framework programmes, and the European marine science community, in particular, has contributed significantly to new knowledge and the discussion on climate change alike. But also in Europe, communication of these results to policymakers and to the general public can be improved. Only when the facts are known, can the implications be studied. And only with public support, can the necessary policies be designed and implemented.

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