Building our sustainable future

How much more CO_2 will the ocean be able to take up in a given time period?

The ocean could take up more - but not so much all at once

Reducing the inputs now will buy us time

Illustrations: www.colourbox.no

How efficient will the ocean carbon sink be in the future?

Which factors cause changes in this sink?

What implications does this have for actions to mitigate climate change?

CARBOCHANGE gives answers through:

- Comprehensive observations of the ocean-climate system
- In-depth understanding of key processes
- Improved prediction of expected changes

CARBOCHANGE provides the knowledge base for sustainable climate policies

CARBOCHANGE consortium

University of Bergen	**Norway**
VitusLab	Denmark
IFREMER	France
LSCE / CEA	France
University Pierre and Marie Curie	France
AWI Bremerhaven	Germany
GEOMAR	Germany
MPI for Meteorology	Germany
University of Bremen	Germany
Marine Research Institute	Iceland
NUI Galway	Ireland
INRH	Morocco
NIOZ	The Netherlands
NERSC - Nansen Center	Norway
UniResearch, Bjerknes Centre	Norway
CSIC	Spain
University of Las Palmas de Gran Canaria	Spain
University of Gothenburg	Sweden
ETH Zürich	Switzerland
University of Bern	Switzerland
Met Office	UK
National Oceanography Centre	UK
Plymouth Marine Laboratory	UK
University of Bristol	UK
University of East Anglia	UK
CSIR	South Africa
Princeton University	USA
Dalhousie University, Halifax	Canada

Project Office:
University of Bergen, Geophysical Institute and Bjerknes Centre for Climate Research
Christoph Heinze, Project Coordinator
Christoph.Heinze@gfi.uib.no
Friederike Hoffmann, Scientific Project Manager
Friederike.Hoffmann@gfi.uib.no
Tel. 0047– 55582088
www.carbochange.eu

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CARBOCHANGE

Changes in carbon uptake and emissions by oceans in a changing climate

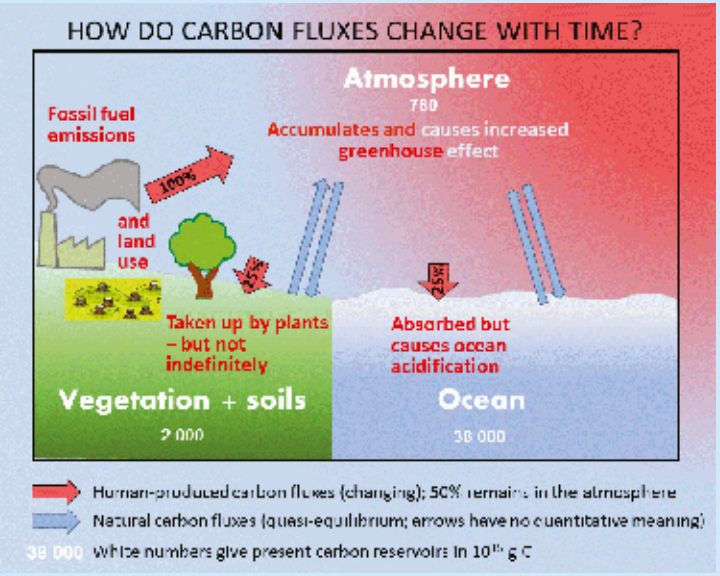
www.carbochange.eu

EU FP7 Collaborative Project
Large-Scale Integrating Project

March 2011- February 2015

Facing the challenges

- Carbon dioxide (CO_2) from fossil fuel burning and land-use changes is the main driver for human-induced climate change
- Currently, the ocean takes up about 25% of the carbon dioxide emitted annually by human activities
- The uptake rate is changing



Understanding the problem: how much, where, when?

How much CO_2 have the world oceans taken up so far?

How much will they take up in the future?

What are the interactions with progressing climate change?

Observe the changes

The amount of CO_2 taken up by the ocean is not the same everywhere. To obtain a complete picture of global carbon uptake and emissions by the oceans, CARBOCHANGE uses a comprehensive network of buoys, floats and research vessels, as well as commercial vessels as voluntary observing ships ("VOS lines"). While these ships cross the oceans, scientific equipment installed onboard continuously measures relevant variables. All incoming data are quality-controlled, standardized and archived. The data are made available for scientists all over the world via the data portal at our project website.


Image: Dorothee Bakker


Image: Pete Brown

Quantify the processes

A lot happens to the CO_2 after it is taken up by the ocean. It can be transported by water masses, precipitated as carbonates, transformed into organic carbon by planktonic algae, released again to the atmosphere or buried forever in the sediments. CARBOCHANGE will quantify these key physical, chemical and biogeochemical processes through a combination of field observations, process studies, and modelling.

Predict the future

CARBOCHANGE is establishing model systems that will contribute to predicting the future climate. Observational data from the project will be used to calibrate and improve existing models. Using these models, we are quantifying the carbon sources and sinks of the ocean of the past and present. We are also predicting future changes in the ocean carbon cycling with respect to ongoing and future CO_2 emissions and associated climate change.

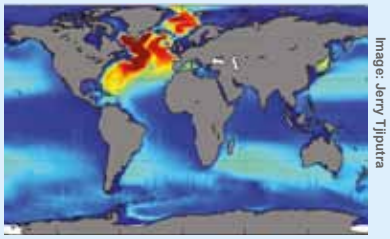


Image: Jerry Tjiputra

Summarize the results and inform policy makers


Illustration: www.colourbox.no

All results of the project are summarized into an annual synthesis report. These reports provide information on how much CO_2 the ocean takes up on a regional and global level and what drives associated changes. They further give synthesized information on the state of the carbon cycle in the ocean, and on the vulnerability of the oceanic carbon sink. These results are shared with the scientific community, the general public, and are communicated directly to policy makers. Several CARBOCHANGE scientists are co-authors of the assessment report of the Intergovernmental Panel on Climate Change (IPCC). The project results represent an important contribution to international assessments.

CARBOCHANGE closely cooperates internationally with other institutions and projects in the field of marine carbon cycle research such as the International Geosphere-Biosphere Programme IGBP, Integrated Marine Biogeochemistry and Ecosystem Research IMBER, Surface Ocean Lower Atmosphere Study SOLAS, the Global Carbon Project GCP, and the Regional Carbon Cycle Assessment and Processes RECCAP.

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