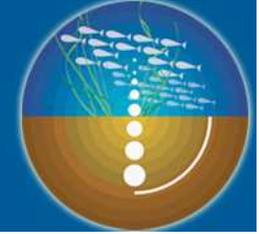


QICS

Quantifying and Monitoring Potential Ecosystem
Impacts of Geological Carbon Storage



QICS

Quantifying and Monitoring Potential Ecosystem Impacts of Geological Carbon Storage

May 2010 to May 2014

PML | Plymouth Marine
Laboratory

BGS
British
Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

 **National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL



**HERIOT
WATT
UNIVERSITY**

UNIVERSITY OF
Southampton

 **Durham
University**

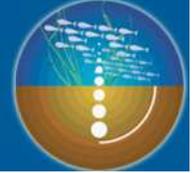


 **University of
BRISTOL**

MANAGING RISK

SCOTTISH
ASSOCIATION
for MARINE
SCIENCE

 **NATURAL
ENVIRONMENT
RESEARCH COUNCIL**

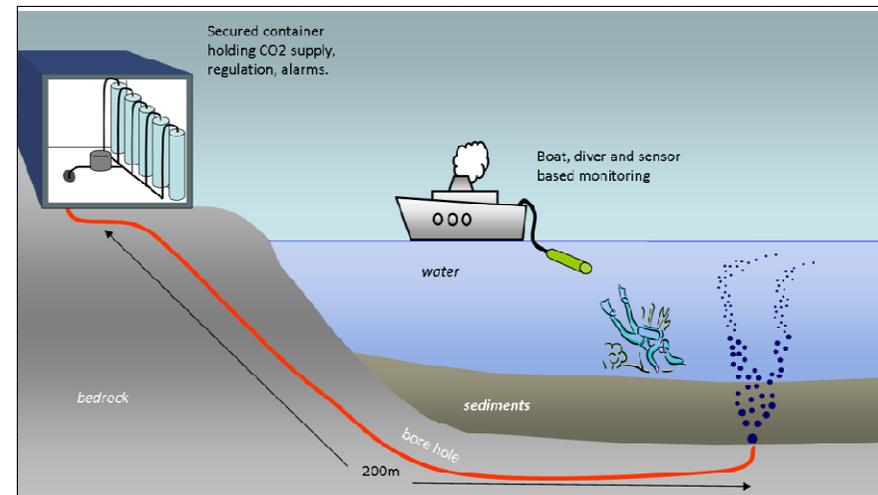


QICS controlled release of CO₂

- Onshore-to-offshore borehole for a controlled submarine release of CO₂
- Measuring and monitoring of the site prior to, during and after the release

Objectives

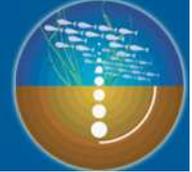
- **Quantify** the transfer and transformations of CO₂ from the store reservoir to the water-column;
- Evaluate the biogeochemical and ecological **impacts** in the shallow sediment and the water column;
- Establish **techniques** for the detection and monitoring of leaks by examining the spatial and temporal biological, chemical, and physical signatures;
- **Deliver** information that can be directly applied and fully understood by policy makers, planners, public bodies and the public with an interest in planned CCS projects.





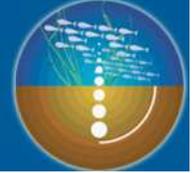
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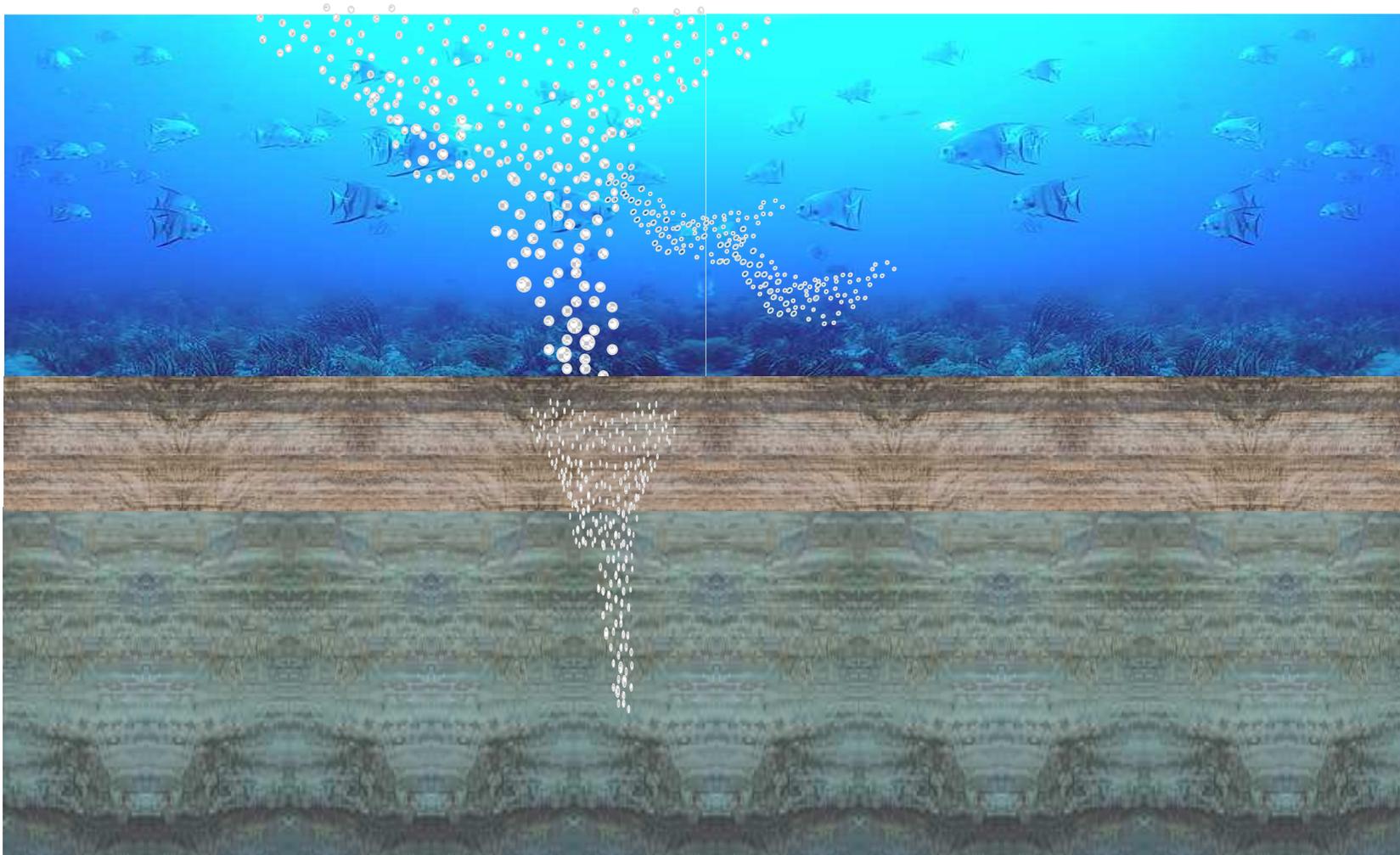


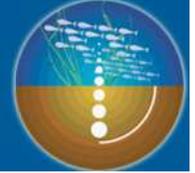
SiteChar and QICS

- **QICS** findings are directly relevant for the 'dry-run' storage licence application for the UK North Sea in **SiteChar**
 - A **monitoring plan** is a requirement of a storage site licence application
QICS results will inform preparation of the SiteChar monitoring plan
Methods and extent of baseline and repeat monitoring surveys.
Impacts and values from QICS will advise the threshold indicators of leakage at the sea bed
 - **Up-scaling** of modelled CO₂ movement in the subsurface
Enable the '**laboratory**' results from QICS to be related to **monitoring of the storage site** in SiteChar.
- Researchers in **SiteChar** are also conducting research in **QICS**
 - A **3D geological model** of the QICS shallow release site before, during and after CO₂ release draws on modelling **expertise from SiteChar**
 - Experience in the **assessment of features** within the shallow subsurface in SiteChar will inform **interpretation** of the QICS results
 - QICS research to establish the **optimum shallow seismic method** for imaging gas movement in the shallow subsurface will inform **environmental monitoring planning** in SiteChar



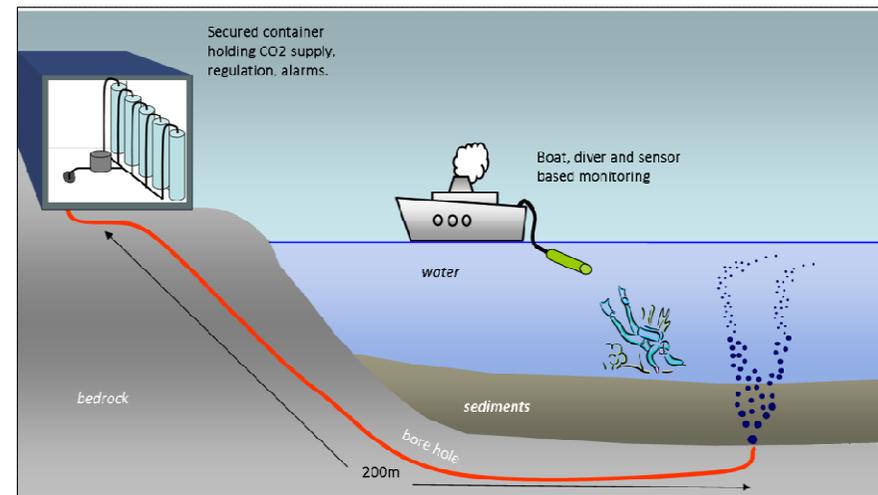
QICS controlled release of CO₂





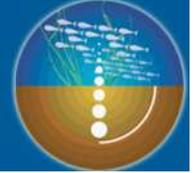
QICS controlled release of CO₂

- Onshore-to-offshore borehole for a controlled submarine release of CO₂
- Measuring and monitoring of the site prior to, during and after the release
 - Water composition, salinity, currents, turbidity
pH, oxidation potential and gas content
 - Acoustic and video ‘bubble’ surveys
 - Sea bed bathymetry
 - Faunal populations and behaviour at sea bed
 - Gas, pH, thermal and metal fluxes at sea bed
 - Fauna and microbes, also temperature, pH,
gases and metals within sea bed sediments
 - Gas migration within sea bed sediments
 - Subsurface conditions from seismic surveys



Knowledge exchange:

QICS website www.bgs.ac.uk/QICS; Stakeholder Advisory Panel; Best Practice Manual; End-of-project Stakeholder Workshop; Conference presentations



QICS Challenges

Scientific and communication challenges

To understanding the geological, chemical and biological impacts of a leak from a CCS system and the physics of CO₂ transfer and dispersion by:

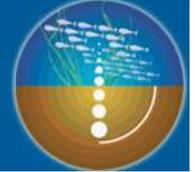
- **Quantifying** the transfer and transformations of CO₂ from the storage reservoir to the seafloor ecosystem, into the water-column, and potentially the atmosphere;
- Evaluating the biogeochemical and ecological **impacts** in the shallow sediment and the water column;
- Establishing **techniques** for the detection and monitoring of leaks by examining the spatial and temporal biological, chemical, and physical signatures that may result

Deliver information that can be directly applied and fully understood by policy makers, planners, public bodies and the public with an interest in planned CCS projects



QICS

Quantifying and Monitoring Potential Ecosystem
Impacts of Geological Carbon Storage



SiteChar and QICS

- QICS findings are directly relevant for the 'dry-run' storage licence application for the UK North Sea in SiteChar
 - A monitoring plan is a requirement of a storage site licence application and the emerging QICS results will inform preparation of the SiteChar output to the Scottish Government regulatory group, including the methods and extent of baseline and repeat monitoring surveys.
 - The impacts and values determined in QICS will advise the threshold indicators of leakage of CO₂ from a storage site at the sea bed in the monitoring plan.
 - Up-scaling of modelled CO₂ movement in the subsurface, from the scale of the release site to that of typical scenarios in the North Sea, will enable the 'laboratory' results from QICS to be related to monitoring of the storage site in SiteChar.
- Researchers in SiteChar are also conducting research in QICS
 - Integrating subsurface data sets, interpreting and attributing a 3D geological model of the QICS shallow release site before, during and after release.
 - Establishing the optimum shallow seismic method for imaging gas movement in the shallow subsurface relevant