



The RISCS project

Facilities for the geological storage of carbon dioxide, as part of carbon capture and storage (CCS) schemes, will be designed to prevent leakage back to the surface. However, it is important to be able to assess the consequences of any such leakage, should it occur. The RISCS project is concerned with research into the potential environmental impacts that might be associated with any such leakage. Such information might be needed during risk assessments or environmental impact assessments.

January 2011

Issue No 1

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"The RISCS team held their launch meeting at the British Geological Survey in January 2010, and were joined by members of the RISCS scientific advisory board."



Outline of RISCS activities

Here we describe the different work programmes (WP) being undertaken in RISCS

WP1 - Descriptions of Reference Environments and Scenarios

The overall objective of WP1 is to develop a set of credible CO₂ impact scenarios for a range of near surface reference environments. This range of scenarios will provide the basis for mathematical modelling studies that will be undertaken later in the project, and will help to define experimental studies in both terrestrial and marine environments.

WP2 - Assessing and quantifying impacts and recovery in marine environment via laboratory experiments

WP2 will generate the experimental data that are required to understand, model and evaluate possible impacts of CO₂ entering the marine environment. This will be done through various experiments ranging from tests on a laboratory scale with single species/ communities, for example using outdoor "ponds" (mesocosms). In addition, field experiments will be performed using a benthic chamber lander (a submersible mini-lab), and physico-chemical and biological data will be collected at the **natural CO₂ leaking site of Panarea in Italy (left photo)**

In the **outdoor mesocosms, (right photo)**, each chamber with a volume of 5m³ is used to determine the responses of a benthic, planktonic and microbial community representative of a shallow North Sea environment that is exposed to various CO₂ levels. The responses in the mesocosms, which are also subject to species/ environment interactions, will be combined with results from laboratory data performed under more controlled, but less natural conditions.

Contact details:

Jones, David G.

British Geological Survey

Keyworth, Nottingham

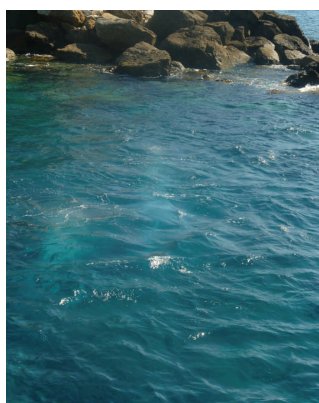
NG12 5GG

+44 (0) 115 936 3576

E-mail: dgj@bgs.ac.uk

For further information:

www.riscs-CO2.eu



WP3 - Assessing impacts in terrestrial environments via field experiments and observations

Field studies in terrestrial environments will assess the potential impact of a CO₂ leak to the surface. A key focus is to establish generic principles governing environmental responses so that the finding of particular studies in specific environments can be generalised, modeled (WP4) and applied across a wide range of environments. WP3 includes work at both experimental CO₂ injection sites (at ASGARD in the UK and Grimsrud Farm in Norway) and field observations in Greece, Italy and France.



Florina, Greece

The first sampling campaign, which took place in June 2010, collected water samples from both springs and cultivated fields in the Florina basin that are irrigated with water containing naturally-occurring CO₂. Major and trace analyses, as well as in situ measurement of key chemical parameters, will enable the assessment of changes to groundwater quality due to the potential impact of CO₂ gas. The next steps include a second water campaign, CO₂ flux measurements, soil and plant sampling and analysis, and a microbiological survey.

ASGARD, Nottingham, UK

Controlled injection of CO₂ at approx 60cm depth will be performed at the ASGARD (Artificial Soil Gassing and Response Detection) experimental site at the University of Nottingham, which is permanently instrumented with soil gas monitoring equipment. Experiments will be carried out to assess the impacts of elevated soil CO₂ concentration on the subsurface/ soil ecosystem and chemistry. A further objective is to characterise the impact of CO₂ on a range of plant types, including pasture plants and crops, such as barley and oil seed rape.



WP4 - Assessing impacts - numerical simulations

Computer models will be developed to describe the form and impact of potential leakage scenarios. There is both a terrestrial and marine component, which will use the experimental knowledge arising from WPs3 and 2 respectively to examine the scenarios identified in WP1.

The primary purpose of using mathematical models is to help gain a better understanding of the key processes that are involved when elevated levels of CO₂ enter the biosphere from below, as a result of leakage from a CO₂ storage system. In essence the terrestrial and marine approaches to modeling are similar, but the marine and terrestrial systems have very different food webs, species and physical characteristics, meaning that the actual models used for each system have different characteristics.

The terrestrial modeling will focus on effects on food crops and groundwater quality. The marine modeling will focus on dispersion of CO₂ and its impacts on key biogeochemical processes and key species.

WP5 - Research Integration and Communication

A key RISCS output will be a Guide to appraising impacts of CO₂ leakage scenarios in Europe. We have already started to develop the guide, tailoring it to the information needs expressed by different stakeholders from within and outside the project's partnership. The Guide will combine the research results from RISCS with those from other projects and published information to provide operators and regulators with practical criteria to evaluate risk and monitoring strategies. Actively discussing our findings is an important part of the project and we will regularly invite external stakeholders to give their input through participation in workshops, responding to questionnaires or on our website (www.riscs-CO2.eu). Further newsletters will follow, keeping you updated with the project's development and communication opportunities.