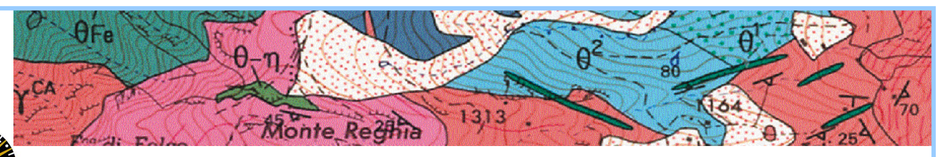

ULTimateCO2:
A FP7 European Project dedicated to the understanding of the long term fate of geologically stored CO2

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Introduction

Although the technical feasibility of CCS has been proven with the development of small-scale pilot sites that draw on oil and gas industry experience, the EU Directive on the Geological Storage of CO2 requires operators to demonstrate that the long-term fate of the CO2 in the reservoir will ensure permanent containment. Other stakeholders, notably the general public and their representatives, seek answers to questions on the behaviour and impact of the injected CO2: "***What will happen to the CO2?*** "***Will it leak from the chosen reservoir?***" "***Will it stay underground?***" "***For how long?***". Such questions, at whatever level, can only be answered convincingly through a better understanding of a chain of complex physical and chemical processes. This requires a significant increase in scientific knowledge beyond the state-of-the-art since, unlike other domains we currently have limited experience to draw on for this new technology.

Objectives

The aim of the **ULTimateCO2** project is to significantly advance our knowledge of specific processes that may affect the long-term fate of geologically stored CO2 and yield improved and validated tools for predicting long-term storage site performance through a dedicated four-year collaborative programme covering:

i) Detailed laboratory, field and modelling studies of the most relevant physical and chemical processes and their impacts in the long-term, namely:

o trapping mechanisms in the reservoir (structural, dissolution, residual and mineral [SDRM]);

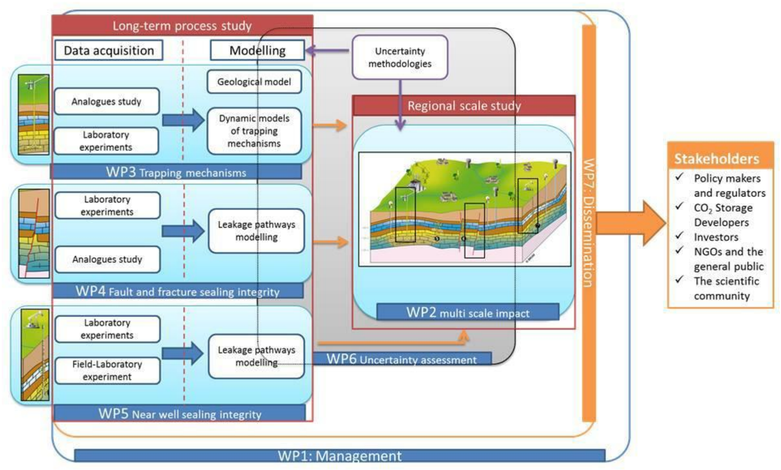
o fluid-rock interactions and effects on mechanical integrity of the caprock and the sealed faults;

o leakage associated with mechanical and chemical damage in the well vicinity;

ii) Integration of the results into assessing the overall long-term behaviour of storage sites at reservoir and basin scale in terms of efficiency and security, and including other important aspects, such as far-field brine displacement and fluid mixing, integrity of sealed faults compartmentalising depleted gas reservoirs, and chemistry change in overlying groundwater resources due to leakage through abandoned wells.

The long-term prediction of CO2 evolution during geological storage will be made more robust by addressing the uncertainty associated with numerical modelling at all stages…

Work Package Structure for the FP7 ULTimateCO2 Project

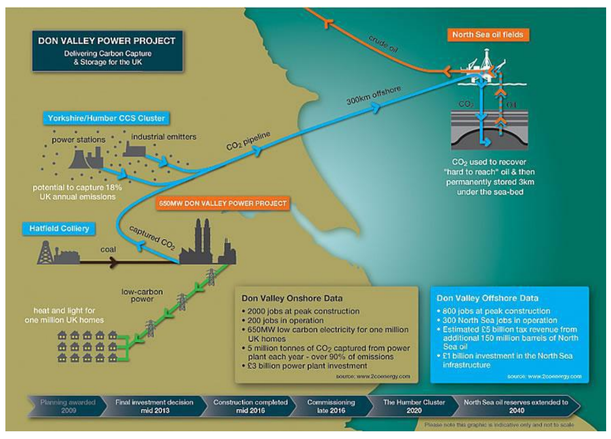


Demonstration sites

ULTimateCO2 will benefit from this rapidly evolving European CCS context by integrating data from such large-scale demonstration projects into its work programme, which was not easily possible until now. Demonstration sites will serve as a basis for investigating both long-term efficiency and safety of CO2 storage at reservoir and regional scale, thus giving greater credibility to the results. Collaboration is already underway with two demonstration sites :

• **NER300 candidate ULCOS-BF in France** operated by ArcelorMittal GeoLorraine (onshore sandstone deep saline formation in the North East of France);

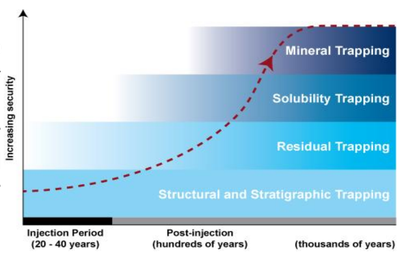
• **EEPR Don Valley demonstration site in the UK** operated by National Grid (offshore North Sea sandstone deep saline formation and/or depleted hydrocarbon formations);



Methodology

WP3 - Reservoir trapping evolution

Objectives:
To increase the demonstration of the safety of reservoir trapping.
To provide static models for evaluation of SDRM trapping at reservoir scales.

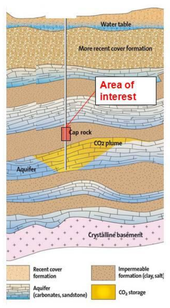


To assess specific chemical processes in storage formations over long time scales. To integrate results and identify broader generic lessons learned for inclusion in WP7.

WP4 - Sealing integrity of faulted and fractured caprock systems

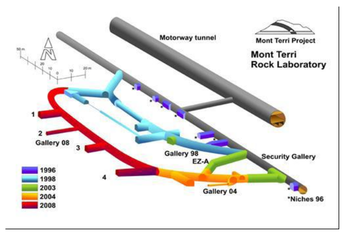
Objectives :
To investigate the long-term integrity of sealed faults or fractured caprocks
To compile of fault and fracture network properties based on field data
To study the effects of chemical degradation
To assess the influence long-term changes in thermo-mechanical basin conditions (stress, fluid pressure and temperature conditions) and (ii) pressure history in case of storage in depleted gas reservoirs

WP5 - Near-well sealing integrity

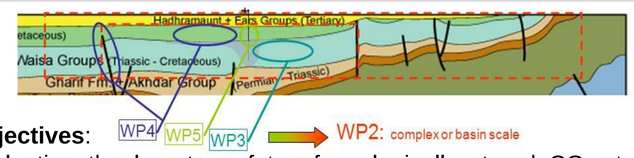


Objectives:
To evaluate the well sealing integrity by:
•observing and evaluating the bounding quality between the well compartments;
•determining the fluid-rock interactions occurring within the different well compartments (casing, cement sheet, caprock, and cement plug)
•simulating and extrapolating at a long-term scale the sealing properties evolution of the well compartments and their interfaces in contact with CO_2 streams.

The use of the **Underground Rock Laboratory of Mont Terri** (Switzerland) will also offer access through galleries to representative samples of caprock clay in order to perform unique experiments on well-leakage assessment (See Manceau et al. 2012, Poster GHGT11 Conference)



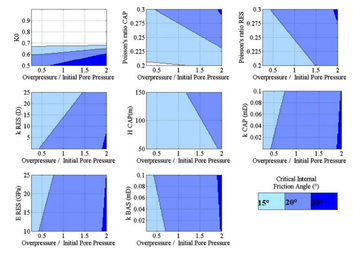
WP2 - Long-term CO2 storage behaviour: integration of study results and adaptation to regional scale



Objectives:
Evaluating the long-term fate of geologically stored CO_2 at the storage complex scale. This study will include:
-the influence of the pressure pulse induced by the CO_2 injection in saline aquifers on brine displacement;
-the upscaling of trapping mechanisms of CO_2 stored in saline aquifers;
-the long-term sealing integrity of fractured caprock and faulted system;
-the impact of CO_2 leakage through wells from saline aquifers to overlying groundwaters;

WP6 - Uncertainty assessment

Objectives
To provide a general methodology for uncertainty assessment that is applicable to the geophysical systems involved for CO_2 storage and to implement application examples.



To provide a state-of-the-art of norms and uncertainty assessment approaches investigating the modelling of spatially random parameters and the account for epistemic uncertainty.
To implemente the proposed framework in close connection with the work packages 2-5. For this purpose, simulation models will be selected in each WP, for which a sensitivity and uncertainty assessment will be carried out.

WP7 - Recommendations and dissemination

Objectives
To produce overall project recommendations from activity in the RTD WPs 2,3,4,5 and 6.
To disseminate project

To disseminate project results to five stakeholder groups; policy makers & regulators, investors, CO_2 storage developers, the scientific community and the general public.
To increase each stakeholder group's understanding of the efficiency, safety, and uncertainties of the long-term evolution of CO_2 geological storage.
To enable exploitation of project results by each stakeholder group.

More information on www.ultimateco2.eu

www.brgm.fr