IMPACTS

Project no.:
308809

Project acronym:
IMPACTS

Project full title:
The impact of the quality of CO_2 on transport and storage behavior

Collaborative large-scale integrating project

FP7 - ENERGY.2012-1-2STAGE

Start date of project: 2013-01-01
Duration: 3 years

D 4.2.2
Plan on dissemination activities

Due delivery date: 2013-12-31
Actual delivery date: 2014-01-13

Organisation name of lead participant for this deliverable:
SINTEF Energi AS

Project co-funded by the European Commission within the Seventh Framework Programme (2012-2015)		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential , only for members of the consortium (including the Commission Services)	

Deliverable number:	D 4.2.2
Deliverable name:	Plan on dissemination activities
Work package:	WP 4.2 Project dissemination
Lead participant:	SINTEF ER

Author(s)		
Name	**Organisation**	**E-mail**
Astrid Lilliestråle	SINTEF ER	Astrid.Lilliestrale@sintef.no
An Hilmo	SINTEF ER	An.Hilmo@sintef.no

Abstract

This deliverable describes the dissemination activities for IMPACTS during the project period 2013-2015. The dissemination activities are organized under the work package (WP) 4.2 Project dissemination, but dissemination will also occur in other WPs, for example as journal publications, presentations, meetings and workshops or courses and summer schools.

TABLE OF CONTENTS

1 INTRODUCTION

IMPACTS is a collaborative project co-funded by the European Commission under the 7th Framework Programme. The objective of IMPACTS is to develop the CO_2 quality knowledge base required for defining norms and regulations to ensure safe and reliable design, construction and operation of CO_2 pipelines and injection equipment, and safe long-term geological storage of CO_2. By this, IMPACTS supports the objectives of the Innovation Union and contributes to the implementation of large-scale CCS and the competitiveness of the European CCS industry.

The dissemination activities of IMPACTS are organized under work package (WP) 4.2 Project dissemination. Typical activities are development of the project website, newsletters, meetings and workshops, courses, summer schools, deliverables from the project and publications. Even though WP4.2 has the overall responsibility for dissemination in the project, many activities will also be performed by the other WPs, such as journal publications, presentations, meetings and workshops or courses and summer schools.

This deliverable gives an overview of the already performed and planned dissemination activities of IMPACTS throughout the whole project period, from 2013 to 2015.

2 WEBSITE

As a part of the running dissemination activities a website for the IMPACTS project has been established. The website will be an information channel and a source of public project information and results. The web-address is http://www.sintef.no/impacts

Information about the project like objectives, project overview, activities and participants are given. The website will be continuously updated with public information about project news, reports and publications.

The website was launched in January 2013. Two example pages from the website are shown in the figures below.

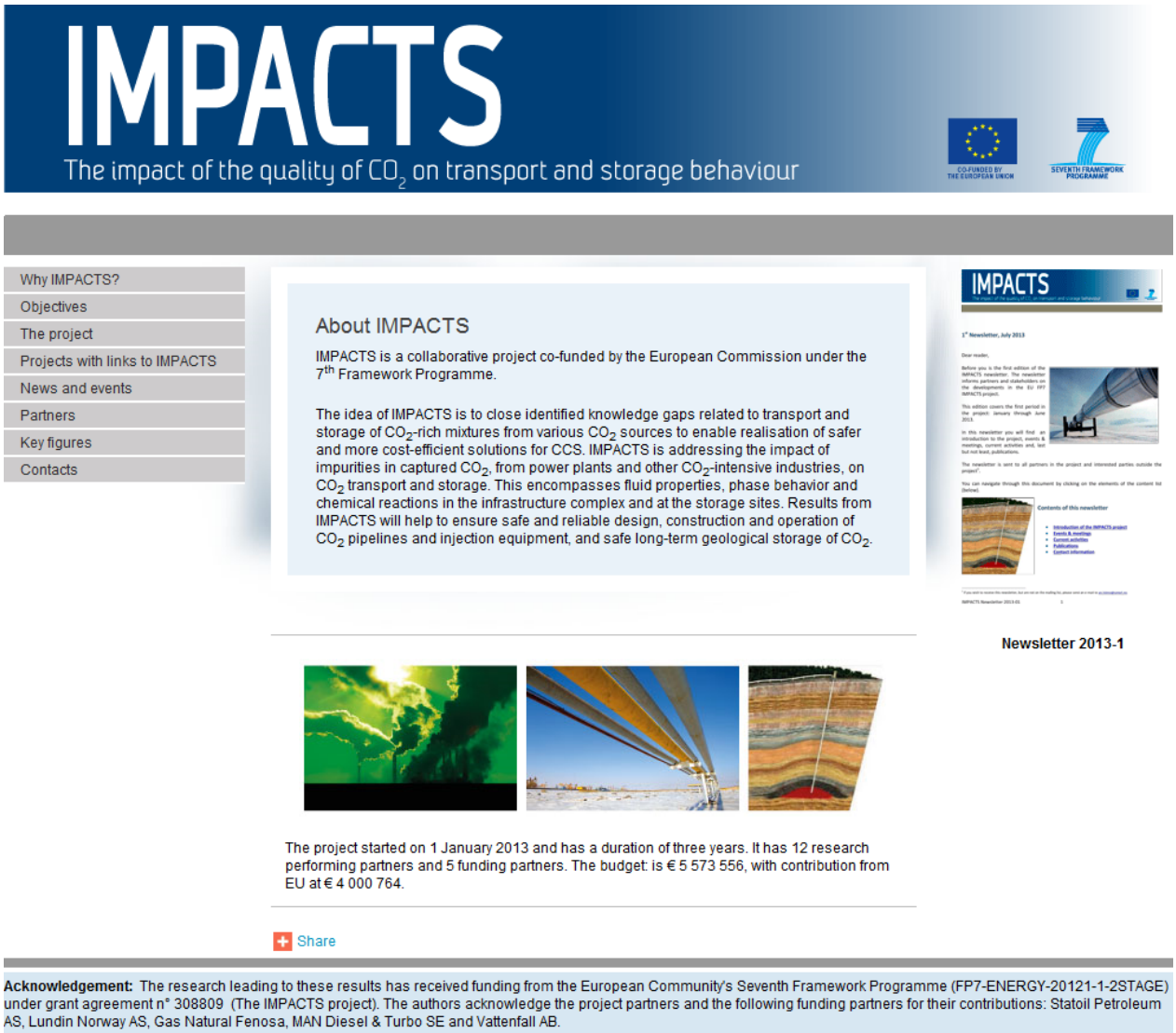


Figure 1: IMPACTS website (start page) as per November 2013.

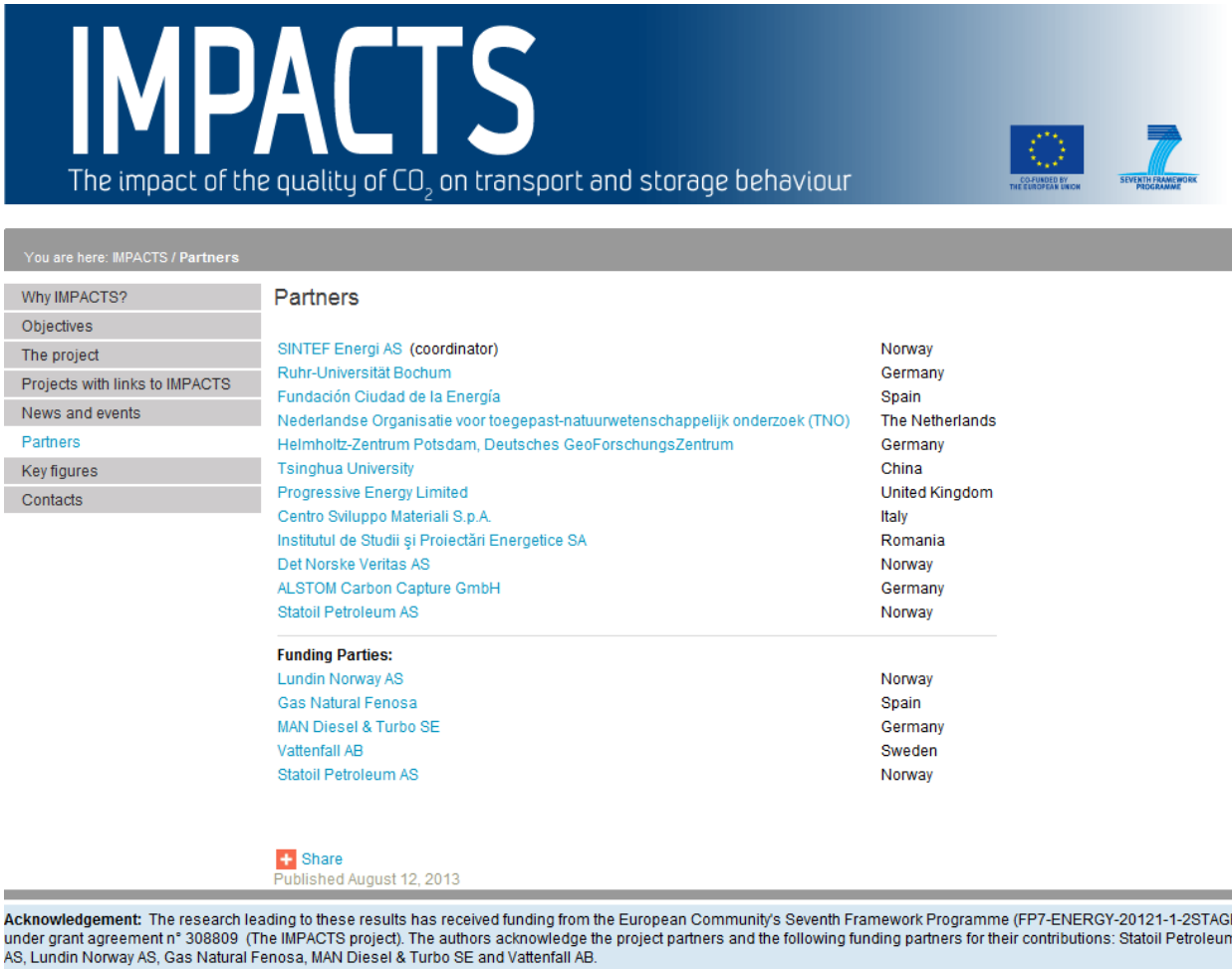
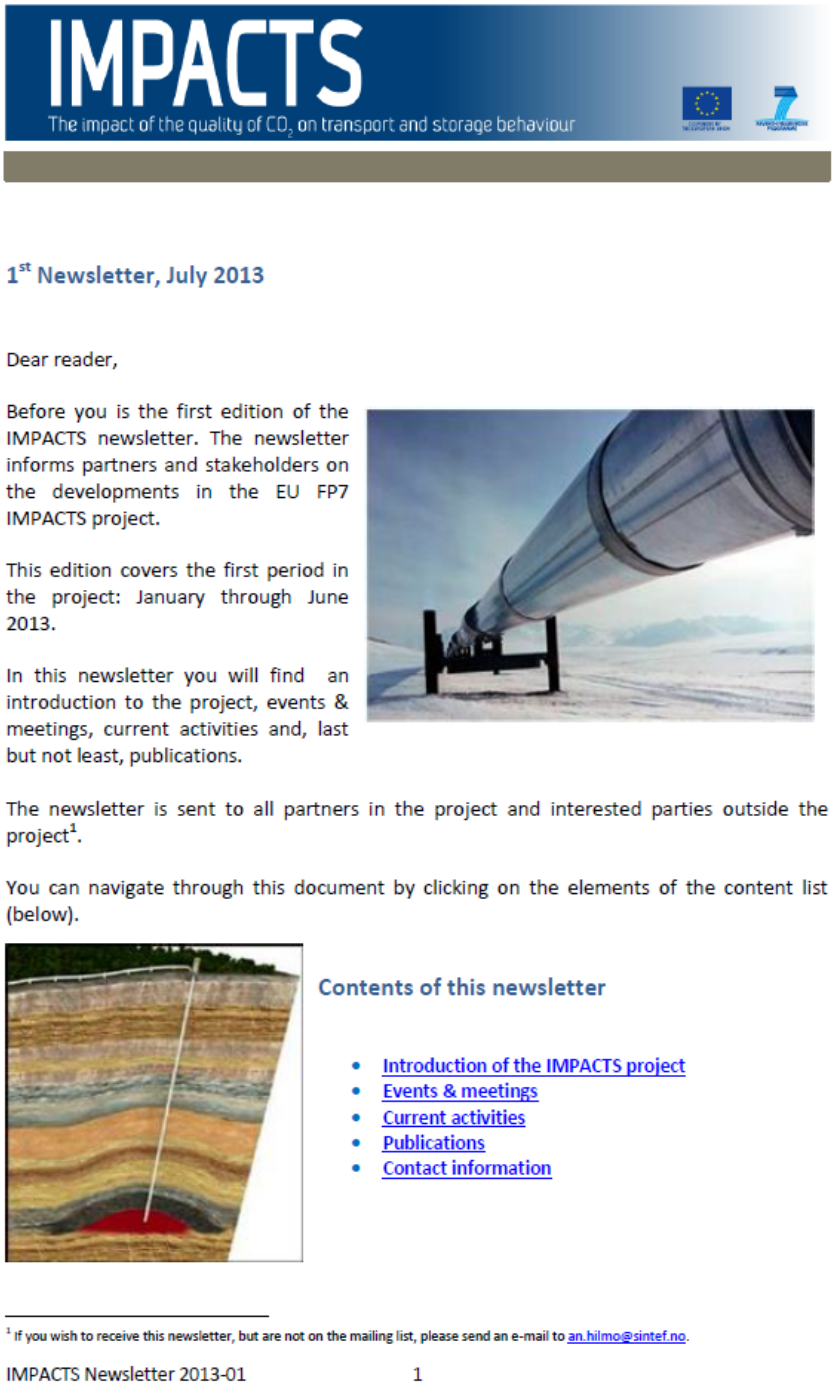


Figure 2: The participant page where all participants are listed including link to their respective websites.

3 NEWSLETTERS

An electronic newsletter is distributed via email to the IMPACTS consortium and another 300 recipients in the SINTEF CCS email list every six months. The IMPACTS participants are also encouraged to further spread the newsletter in their networks. The first newsletter appeared in June 2013 and the second newsletter appeared in December 2013. The newsletters are prepared by TNO with input from all participants, and summarize the project progress, events, meetings and publications in the last six month period.



IMPACTS

The impact of the quality of CO_2 on transport and storage behaviour

1st Newsletter, July 2013

Dear reader,

Before you is the first edition of the IMPACTS newsletter. The newsletter informs partners and stakeholders on the developments in the EU FP7 IMPACTS project.

This edition covers the first period in the project: January through June 2013.

In this newsletter you will find an introduction to the project, events & meetings, current activities and, last but not least, publications.

The newsletter is sent to all partners in the project and interested parties outside the project[1].

You can navigate through this document by clicking on the elements of the content list (below).

Contents of this newsletter

- Introduction of the IMPACTS project
- Events & meetings
- Current activities
- Publications
- Contact information

[1] If you wish to receive this newsletter, but are not on the mailing list, please send an e-mail to an.hilmo@sintef.no.

IMPACTS Newsletter 2013-01 1

Figure 3: IMPACTS newsletter in June 2013

4 PUBLIC MEETINGS AND WORKSHOPS

4.1 IMPACTS kick-off meeting on 22 January 2013

The IMPACTS Kick-off Meeting (KoM), open for both IMPACTS participants and external audience, took place on 22 January 2013 in Trondheim with 32 participants. Table 1 shows the agenda. All presentations are available for IMPACTS consortium on the project eRoom.

Table 1: Agenda

Time	Title	Presenter	Documents
08:00	*Registration and coffee*		
08:45	Welcome The challenge and potential of IMPACTS	Nils A. Røkke, SINTEF, Chair of the Executive Board	
09:00	The role of IMPACTS	Peter Petrov, Project Officer, European Commission	
09:30	IMPACTS – Overview and targets	Mona J. Mølnvik, SINTEF ER, Coordinator	
09:45	*Coffee break*		
10:15	Objectives and structure of the IMPACTS project Presentation of Sub-projects (SPs): SP1 Fundamental properties of CO_2 mixtures SP2 Techno-economic assessment of CO_2 chains SP3 Synthesis and recommendations SP4 Project management and dissemination	Astrid Lilliestråle, SINTEF ER Alexandre Morin, SINTEF ER Charles Eickhoff, PEL Filip Neele, TNO Astrid Lilliestråle, SINTEF ER	Annex I SP1 SP2 SP3 SP4
11:00	Financial and administrative matters	Peter Petrov, Project Officer , European Commission	
11:30	*Lunch*		

Figure 4: Peter Petrov, European Commision, Mona J. Mølnvik, SINTEF ER (Coordinator) and Nils A. Røkke, SINTEF (Chair of the Executive Board) at the IMPACTS KoM 22 January 2013.

4.2 Technical meeting on 23 January 2013

A technical meeting/workshop was organized in Trondheim on 23 January 2013 (the day after the KoM). Table 2 shows the presentations given during the meeting. The objective was to show the status of research relevant for IMPACTS at some of the participating partners, and to discuss the ambitions for the project. The day ended with a joint workshop for SP1 and SP2 to discuss and agree upon actions for the workshop on 5-6 March at TNO in Utrecht, The Netherlands.

Table 2: Presentations

Time	Title	Presenter
09:00	Welcome and safety note	Mona J. Mølnvik, SINTEF ER
	Technical presentations Status and ambitions related to IMPACTS:	
09:05	CIUDEN's testing facilities for CO_2 Capture, Transport and Storage	Tomas Coca and Daniel Fernandez, CIUDEN
09:20	The Ketzin field site	Axel Liebscher, GFZ
09:35	The Teesside Low Carbon project	Charles Eickhoff, PEL
09:50	Coffee break	
10:05	Insights from operation of CCS interfaces and integration	Gelein de Koeijer, Statoil
10:20	Transient flow of CO_2 with impurities	Svend Tollak Munkejord, SINTEF ER
10:35	Describing Hydrate Formation by Intersection of Fundamental Equations	Roland Span, RUB
10:50	*Break*	
11:00	SP-workshops	SP-leaders
12.00	Lunch	

4.3 Dissemination workshop *Strategies for CO_2 transport* on 4 June 2013

The IMPACTS dissemination workshop *Strategies for CO_2 transport* was arranged on 4 June 2013 in Trondheim, on the same day as the welcome reception of the 7th Trondheim CCS Conference (TCCS-7). The workshop had 26 participants, both from the IMPACTS project and from other projects working with CO_2 transport.

The aim of the workshop was to present and discuss public results from the first deliverables of the IMPACTS project, to present some of the industrial partners work on CO_2 transport, and to kick off the collaboration with the EU FP7 project CO2QUEST. Finally, the IMPACTS Coordinator gave an orientation about the on going work in European Energy Research Alliance (EERA) on CO_2 transport.

The following topics were presented:

- CO2Quest - Impact of the Quality of CO_2 on Storage and Transport, Jacob Bensabat, Environmental and Water Resources Engineering Ltd
- JIP - CO_2 pipetrans, Kaare Helle, DNV

- Demonstration of Flow Assurance for CO_2 Transport Operations, Gelein De Koijer, Statoil
- Results from IMPACTS
  - Typical CO_2 mixtures and preparations for the analysis of their techno-economic impacts, Filip Neele, TNO
  - Thermophysical behaviour of CO_2 mixtures, Marcus Richter, RUB
  - Corrosion potentials in CO_2 infrastructure, Massimo Di Biagio, CSM
  - Chemical and physical effects of impurities on CO_2 storage, Sebastian Fischer, GFZ
- Vattenfall and CCS 2013, Christian Bernstone, Vattenfall
- EERA CO_2 transport and concluding remarks, Mona J. Mølnvik, SINTEF ER

Figure 5: Participants at the workshop on 4 June 2013.

4.4 Planned meetings and workshops

The following public meetings and workshops are planned:

4.4.1 Information workshop at GHGT-12

An information workshop will be held at the 12th International Conference on Greenhouse Gas Technologies (GHGT-12) on 5-9 October 2014 in Austin, Texas.

4.4.2 Synthesis, implementation and dissemination workshop at TCCS-8

A synthesis, implementation and dissemination workshop will be arranged in WP3.3 as an independent event during the TCCS-8 conference (summer 2015). This workshop will focus on the main achievements from IMPACTS; the IMPACTS Toolbox and the IMPACTS

Recommendations. The main objective of this arrangement is to make the results from IMPACTS available to the CCS community and secure short lead time from the generation to utilization of results.

The IMPACTS consortium will invite participants from other EU CCS projects, CCS demonstration projects, standardisation organisations, research organisations, regulators, public bodies, national authorities and other relevant stakeholders. The workshops will be open for participants outside of the IMPACTS consortium and also for those not participating in the above mentioned conferences. This task will ensure that information about the workshop is actively disseminated and reaches the right groups and people. A separate meeting will be arranged at TCCS-8 with NIST, ISO, CEN and/or IAPWS to present the final results.

5 COURSES AND SUMMER SCHOOLS

5.1 Nordic CCS Summer School

The Nordic CCS Summer School was organized 18-23 August 2013 by the NORDICSS consortium with 30 participants. Nils A. Røkke, Chairman of IMPACTS Executive Board, was the organizer of the summer school. In addition, several of IMPACTS staff participated in the summer school; An Hilmo (IMPACTS project secretary) in administration and organization and Svend Tollak Munkejord (Chief Scientist at SINTEF ER with a key role in IMPACTS WP1.3) by giving a presentation on CO_2 transport with the title "Flow modeling in CO_2 pipelines, cracks and impurities".

About the summer school:
The NORDICCS consortium is a CCS Center of Excellence consisting of members from leading Nordic CCS research and industry partners. The aim of the Center is to develop Joint Nordic Strategies to promote widespread implementation of CCS, and effectively communicate the strategies to the decision makers and the general public.

An important part of the NORDICCS outreach program was therefore the arrangement of the Nordic CCS Summer school; a one-week intensive course on CO_2 capture, transport and storage and legal and framework conditions necessary for implementation. It was intended mainly for Ph.D. students and young CCS professionals new to the field. The course had a distinct industrial focus that was ensured by involving lecturers from industry, as well as a one-day excursion to the CO_2 capture plant at Technology Centre Mongstad (TCM). The rest of the course was held on the NTNU campus in Trondheim. This allowed the students to obtain a good understanding of the size and complexity involved with industrial CCS projects as well as the theoretical knowledge of CCS. By covering the complete CCS value chain and addressing framework issues such as life cycle analysis, financing, HSE, public acceptance, political and legal issues and innovation, the students will develop knowledge on how CCS works in "real life". The lecture program can be found on the NORDICCS website.

Figure 6: Attendees and lecturers at the summer school. Here at the island of Munkholmen outside Trondheim. Photo: Sithara Dayarathna, Telemark University College

5.2 IEAGHG International CCS Summer School

IMPACTS will aim at being present with lecturers at the IEAGHG International CCS Summer School, which takes place in august every year.

In 2013, the 7th IEAGHG International CCS Summer School was held at University of Nottingham, UK, on 21-26 July. The IMPACTS project management has close contacts with the

IEAGHG organizers from the organization of the 2010 summer school by SINTEF and NTNU on Svalbard in Norway. IMPACTS contacted IEAGHG in 2013 to ask if they needed help to find appropriate lecturers within CO_2 transport, but they had all the resources they needed.

In 2014, the Summer School will be held in Austin, Texas. IMPACTS is keeping contacts with IEAGHG regarding the organization and lecturers of the summer school.

5.3 CCS course in Romania

A CCS course at Master level will be arranged by ISPE in Romania (WP3.3) and be open for students and people from industry outside of IMPACTS. IMPACTS researchers will be invited to give lectures at the course. This task will help to spread information about the workshop to relevant industrial, research and student groups.

6 DELIVERABLES

In order to disseminate the results from the project, all deliverables will be published on the project website: http://www.sintef.no/Projectweb/IMPACTS/Results/

Restricted deliverables will published with title, authors and public introduction only, whereas the full public deliverables will be made available on the website. All deliverables are available for the IMPACTS consortium on the IMPACTS eRoom.

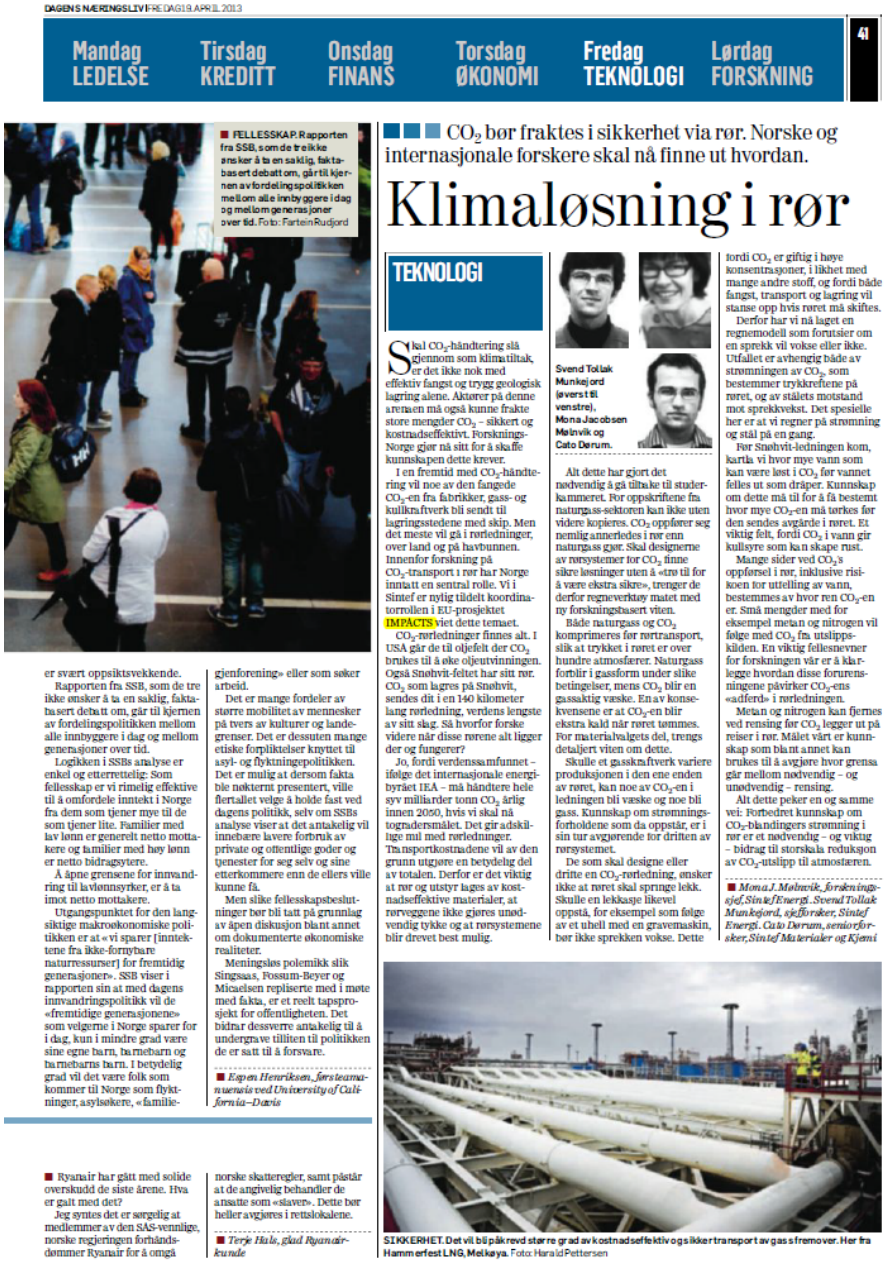
7 PUBLICATIONS

IMPACTS is encouraging popular science articles, conference presentations and journal publications from the project and gives this topic high priority in the PMT meetings.

7.1 Popular science articles

Mona J. Mølnvik, IMPACTS Coordinator, and Svend Tollak Munkejord, Chief Scientist at SINTEF ER with a key role in IMPACTS WP1.3, and Cato Dørum in SINTEF Materials and Chemistry, published a feature article about CO_2 transport and IMPACTS called "Climate solution in pipelines" in Dagens Næringsliv, Norway's leading business paper, on 19 April 2013.

IMPACTS is encouraging more articles in Norwegian and European press.



DAGENS NÆRINGSLIV FREDAG 19. APRIL 2013

Mandag LEDELSE | Tirsdag KREDITT | Onsdag FINANS | Torsdag ØKONOMI | Fredag TEKNOLOGI | Lørdag FORSKNING | 41

FELLESSKAP. Rapporten fra SSB, som de trekke ønsker å ta en saklig, faktabasert debatt om, går til kjernen av fordelingspolitikken mellom alle innbyggere i dag og mellom generasjoner over tid. Foto: Fartein Rudjord

er svært oppsiktsvekkende.

Rapporten fra SSB, som de tre ikke ønsker å ta en saklig, faktabasert debatt om, går til kjernen av fordelingspolitikken mellom alle innbyggere i dag og mellom generasjoner over tid.

Logikken i SSBs analyse er enkel og etterrettelig: Som fellesskap er vi rimelig effektive til å omfordele inntekt i Norge fra dem som tjener mye til de som tjener lite. Familier med lav lønn er generelt netto mottakere og familier med høy lønn er netto bidragsytere.

Å åpne grensene for innvandring til lavlønnsyrker, er å ta imot netto mottakere.

Utgangspunktet for den langsiktige makroøkonomiske politikken er at «vi sparer [inntektene fra ikke-fornybare naturressurser] for fremtidig generasjoner». SSB viser i rapporten sin at med dagens innvandringspolitikk vil de «fremtidige generasjonene» som velgerne i Norge sparer for i dag, kun i mindre grad være sine egne barn, barnebarn og barnebarns barn. I betydelig grad vil det være folk som kommer til Norge som flyktninger, asylsøkere, «familiegjenforening» eller som søker arbeid.

Det er mange fordeler av større mobilitet av mennesker på tvers av kulturer og landegrenser. Det er dessuten mange etiske forpliktelser knyttet til asyl- og flyktningepolitikken. Det er mulig at dersom fakta ble nøkternt presentert, ville flertallet velge å holde fast ved dagens politikk, selv om SSBs analyse viser at det antakelig vil innebære lavere forbruk av private og offentlige goder og tjenester for seg selv og sine etterkommere enn de ellers ville kunne få.

Men slike fellesskapsbeslutninger bør bli tatt på grunnlag av åpen diskusjon blant annet om dokumenterte økonomiske realiteter.

Meningsløs polemikk slik Singsaas, Fossum-Beyer og Micaelsen repliserte med i møte med fakta, er et reelt tapsprosjekt for offentligheten. Det bidrar dessverre antakelig til å undergrave tilliten til politikken de er satt til å forsvare.

Espen Henriksen, førsteamanuensis ved University of California–Davis

■ Ryanair har gått med solide overskudd de siste årene. Hva er galt med det?

Jeg syntes det er sørgelig at medlemmer av den SAS-vennlige, norske regjeringen forhåndsdømmer Ryanair for å omgå norske skatteregler, samt påstår at de angivelig behandler de ansatte som «slaver». Dette bør heller avgjøres i rettslokalene.

Terje Hals, glad Ryanair-kunde

■■■ CO_2 bør fraktes i sikkerhet via rør. Norske og internasjonale forskere skal nå finne ut hvordan.

Klimaløsning i rør

TEKNOLOGI

Skal CO_2-håndtering slå gjennom som klimatiltak, er det ikke nok med effektiv fangst og trygg geologisk lagring alene. Aktører på denne arenaen må også kunne frakte store mengder CO_2 – sikkert og kostnadseffektivt. Forskningen Norge gjør nå sitt for å skaffe kunnskapen dette krever.

I en fremtid med CO_2-håndtering vil noe av den fangede CO_2-en fra fabrikker, gass- og kullkraftverk bli sendt til lagringsstedene med skip. Men det meste vil gå i rørledninger, over land og på havbunnen. Innenfor forskning på CO_2-transport i rør har Norge innlatt en sentral rolle. Vi i Sintef er nylig tildelt koordinatorrollen i EU-prosjektet IMPACTS viet dette temaet.

CO_2-rørledninger finnes alt. I USA går de til oljefelt der CO_2 brukes til å øke oljeutvinningen. Også Snøhvit-feltet har sitt rør. CO_2 som lagres på Snøhvit, sendes dit i en 140 kilometer lang rørledning, verdens lengste av sitt slag. Så hvorfor forske videre når disse rørene alt ligger der og fungerer?

Jo, fordi verdenssamfunnet – ifølge det internasjonale energibyrået IEA – må håndtere hele syv milliarder tonn CO_2 årlig innen 2050, hvis vi skal nå togradersmålet. Det gir adskillige mil med rørledninger. Transportkostnadene vil av den grunn utgjøre en betydelig del av totalen. Derfor er det viktig at rør og utstyr lages av kostnadseffektive materialer, at rørveggene ikke gjøres unødvendig tykke og at rørsystemene blir drevet best mulig.

Svend Tollak Munkejord (øverst til venstre), Mona Jacobsen Mølnvik og Cato Dørum.

Alt dette har gjort det nødvendig å gå tiltake til studerkammeret. For oppskriftene fra naturgass-sektoren kan ikke uten videre kopieres. CO_2 oppfører seg nemlig annerledes i rør enn naturgass gjør. Skal designerne av rørsystemer for CO_2 finne sikre løsninger uten å «tro til for å være ekstra sikre», trenger de derfor regneverktøy matet med ny forskningsbasert viten.

Både naturgass og CO_2 komprimeres før rørtransport, slik at trykket i røret er over hundre atmosfærer. Naturgass fortblir i gassform under slike betingelser, mens CO_2 blir en gassaktig væske. En av konsekvensene er at CO_2-en blir ekstra kald når røret tømmes. For materialvalgets del, trengs detaljert viten om dette.

Skulle et gasskraftverk variere produksjonen i den ene enden av røret, kan noe av CO_2-en i ledningen bli væske og noe bli gass. Kunnskap om strømningsforholdene som da oppstår, er i sin tur avgjørende for driften av rørsystemet.

De som skal designe eller drifte en CO_2-rørledning, ønsker ikke at røret skal springe lekk. Skulle en lekkasje likevel oppstå, for eksempel som følge av et uhell med en gravemaskin, bør ikke sprekken vokse. Dette fordi CO_2 er giftig i høye konsentrasjoner, i likhet med mange andre stoff, og fordi både fangst, transport og lagring vil stanse opp hvis røret må skiftes.

Derfor har vi nå laget en regnemodell som forutsier om en sprekk vil vokse eller ikke. Utfallet er avhengig både av strømningen av CO_2, som bestemmer trykkreftene på røret, og av stålets motstand mot sprekkvekst. Det spesielle her er at vi regner på strømning og stål på en gang.

Før Snøhvit-ledningen kom, kartla vi hvor mye vann som kan være løst i CO_2 før vannet felles ut som dråper. Kunnskap om dette må til for å få bestemt hvor mye CO_2-en må tørkes før den sendes avgårde i røret. Et viktig felt, fordi CO_2 i vann gir kullsyre som kan skape rust.

Mange sider ved CO_2's oppførsel i rør, inklusive risikoen for utrelling av vann, bestemmes av hvor ren CO_2-en er. Små mengder med for eksempel metan og nitrogen vil følge med CO_2 fra utslippskilden. En viktig fellesnevner for forskningen vår er å klarlegge hvordan disse forurensningene påvirker CO_2-ens «adferd» i rørledningen.

Metan og nitrogen kan fjernes ved rensing før CO_2 legger ut på reiser i rør. Målet vårt er kunnskap som blant annet kan brukes til å avgjøre hvor grensa går mellom nødvendig – og unødvendig – rensing.

Alt dette peker en og samme vei: Forbedret kunnskap om CO_2-blandingers strømning i rør er et nødvendig – og viktig – bidrag til storskala reduksjon av CO_2-utslipp til atmosfæren.

Mona J. Mølnvik, forskningssjef, Sintef Energi. Svend Tollak Munkejord, sjeforsker, Sintef Energi. Cato Dørum, seniorforsker, Sintef Materialer og Kjemi

SIKKERHET. Det vil bli på krevd større grad av kostnadseffektiv og sikker transport av gass fremover. Her fra Hammerfest LNG, Melkøya. Foto: Harald Pettersen

Figure 7: Feature article on CO_2 transport in Dagens Næringsliv on 19 April 2013.

7.2 Conference presentations

The IMPACTS project was presented by project manager Astrid Lilliestråle on the 7th Trondheim Conference on CO_2 Capture, Transport and Storage (TCCS-7), 4-6 June 2013.

Several abstracts from IMPACTS will be submitted to the GHGT-12 conference which takes place 5-9 October 2014 in Austin, TX (deadline for abstracts 10 January 2014).

7.3 Journal publications

An article about IMPACTS has been accepted for publication in Energy Procedia following the presentation at the TCC-7 conference (section 7.2), and will be published in Q1 2014.
Title: The IMPACTS project: The impact of the quality of CO_2 on transport and storage behavior. Authors: Astrid Lilliestråle, Mona J. Mølnvik, Grethe Tangen, Jana P. Jakobsen, Svend Tollak Munkejord, Alexandre Morin and Sigmund Ø. Størset.

If accepted, several articles from IMPACTS can be expected in Energy Procedia following the GHGT-12 conference (section 7.2).

8 COLLABORATION WITH OTHER PROJECTS

The CO2QUEST project coordinated by University College London (UCL), can be regarded as IMPACTS' sister project. Svend Tollak Munkejord, SINTEF ER, has been asked to join the advisory board of CO2QUEST, composed of members from industry and academia. The first meeting was held 11 October 2013 at UCL. This information exchange is seen as important, since there are several points of common interest between the projects.

Further collaboration with CO2QUEST and other European projects is planned, and will be detailed during 2014.