Overview (Preliminary) of results of status and needs survey
## Scope of Survey

<table>
<thead>
<tr>
<th></th>
<th>Status of knowledge and planning in country</th>
<th>Additional information needed to progress toward CCS decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy and regulatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public acceptance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 25 respondents
- 17 countries
Statistics

Status

- Not relevant
- Low
- Moderate
- High

Needs

- Not relevant
- Low
- Moderate
- High
Status of Knowledge: Capture

Chart Title

- CO2 source identification
- Volume to be captured
- Source/type of capture
- Cost of capture
- Compression
- Other preparation for transport
- Capture risk and uncertainty, evaluation and mitigation

Legend:
- Not relevant
- Not started
- Started
- Well underway
- Mature plan
- Currently being implemented
Capture: Additional information needed to progress toward CCS decision?

Need: capture

- CO2 source identification
- Volume to be captured
- Source/type of capture
- Cost of capture
- Compression
- Other preparation for transport
- Capture risk and uncertainty, evaluation and mitigation

Legend:
- Not relevant
- Low
- Moderate
- High
Status of Knowledge: Transportation

Not relevant  Not started  Started  Well underway  Mature plan  Currently being implemented

Identify CO2 pipeline network  CO2 pipeline design and operation engineering  Ship design and operation engineering  Ship offload/onload  Transporation risk and uncertainty, evaluation and mitigation  Metering  Cost of transportation
Additional information needed to progress toward CCS decision?

Transportation

Needs transportation

- Identify CO2 pipeline network
- CO2 pipeline design and operation engineering
- Ship design and operation engineering
- Ship offload/onload
- Transportation risk and uncertainty evaluation and mitigation
- Metering
- Cost of transportation

Legend:
- Not relevant
- Low
- Moderate
- High
Status of Knowledge: Storage

Saline capacity identification
Depleted hydrocarbon field identification
CO2 EOR prospect identification
Capacity quantification, maximum pressure, maximum volume
Developing a monitoring plan
Seismicity risk
Capacity risk and mitigation
Leakage risk and mitigation
Environmental risk and mitigation
Well/platform design and operation
Water disposal
Cost of storage and associated activities

- Not relevant
- Not started
- Started
- Well underway
- Mature plan
- Currently being implemented
Additional information needed to progress toward CCS decision? Storage

Needs Storage

- Saline capacity identification
- Depleted hydrocarbon field identification
- CO2 EOR prospect identification
- Capacity quantification, maximum rate, maximum volume
- Developing a monitoring Plan
- Siesmicity risk
- Capacity risk and mitigation
- Leakage risk and mitigation
- Environmental risk and mitigation
- Well/platform design and operation
- Water disposal
- Cost of storage and associated activities

Not relevant Low Moderate High
Additional information needed to progress toward CCS decision? Integration

Chart Title

Regional source/sink matching
Project-specific source-sink matching
Integration risks and mitigation
Accounting framework
Metering

- Not relevant
- Low
- Moderate
- High
Status of Knowledge: Policy and Regulatory

- Policy to incentivise capture
- Policy to incentivise transportation
- Cross boundary transport issues
- Policy to incentivise storage
- Regulation needed to operate onshore capture
- Regulation needed to transport CO2 onshore-offshore
- Management of resource conflicts
- Regulation needed to inject offshore subsea into geological environments

Legend:
- Not relevant
- Not started
- Started
- Well underway
- Mature plan
- Currently being implemented
Additional information needed to progress toward CCS decision? Policy and Regulatory

Needs: regulation

- Policy to incentivise capture
- Policy to incentivise transportation
- Cross boundary issues
- Policy to incentivise storage
- Regulation needed to operate onshore capture
- Regulation needed to transport CO2 onshore-offshore
- Management of resource conflicts
- Regulation needed to inject offshore subsea into geological environments

- Not relevant
- Low
- Moderate
- High
Status of Knowledge: Public Acceptance

Potential public concerns

- Not relevant
- Not started
- Started
- Well underway
- Mature plan
- Currently being implemented
Additional information needed to progress toward CCS decision?

Potential public concerns:

- Not relevant
- Low
- Moderate
- High
Currently, capture technology and CCS storage are not considered as priority. (Our) govt is focused on operational efficiency of existing power plans, which are identified as main source of CO2.

There are some potential projects identified for capture in power generation plants and petrochemical centers.

Potential exist and people talking about it but no study is under way.
Transportation details have been consider for the CO2-EOR project in (one area). The construction of a pipeline has been considered for connecting/matching all the CO2 sources with the sinks (mature fields or saline aquifers).

Different scenarios of transport were explored in the NORDICCS project. Transportation by ship showed to be most cost effective.

Ship design has been studied, but further detailed design work is needed.

Blank rows are outside my area of expertise

Two scores given to contrast operational projects with new/emerging projects
Representative comments Storage

Risk, mitigation, and monitoring data and information comes from global research projects. (we)have knowledge of this research, but have not conducted (our)own research offshore.

For the well/platform design and operation and water disposal - assuming this infrastructure will be the same/similar to current oil and gas industry infrastructure. Design of CO2 compression technology on the platform and designing wells specifically for CO2 injection still needs to be done.

(we ) are among the member country actively participating in the CCS-M Program (CO2 geological storage mapping) of CCOP.
Representative comments Storage

Storage sites have been characterized for many years, to various degrees of detail and more is being done as part of the ongoing feasibility studies for the three sources.

...cost estimates, monitoring, risk and environmental assessments, water disposal and mitigation will be part of the feasibility studies.

CO2 EOR prospects have been identified and studied to some extent but the industry has shown only modest interest. There is, fortunately, increasing focus on the issue. Platform design in connection with EOR is ongoing
Representative comments Storage

The storage assessment for deep saline aquifers and mature fields is done for regional and local scale.
Representative comments Integration

Studied fairly extensively, but not implemented in any actual projects.

I would have marked many of these categories 'Mature Plan' in 2015: there were clear roll out plans available, based on (our commercialization). There remains much activity now, but has taken a step backwards...

Reginal hubs attempting source-sink matching.

Integration of source/sink matching has been undertaken in the techno-economic study.

The source-sink matching is generally poor in (our country)

Strong source-sink matching exists at regional and project-specific scale.

New build power generation plant, if any, will be CCS-ready.
Representative comments Policy

Draft policy and/or regulation has partially been at the level of research. But this draft version has not been adopted by the government.

(We) have gone backwards on incentivization policy

No specific policy and regulatory program for CO2 storage. The oil and gas exploration/production and environmental laws are generally referred to when it comes to CO2 storage discussions.

there is good experience around public acceptance at a local level for the specific competition project, but little progress on the wider issue of acceptance of CCS.

There isn´t a specific regulation for CCUS in the country, however, we have done a regulatory framework analysis that let us identify the key issues to be attended.

CCS is more or less an political non-issue in (our country), although the need for CCS in climate mitigation is acknowledged. When discussed, opinions are spreaded and doubtful. To my knowledge, no regulations except allowing CO2 storage offshore, have been determined.
Representative comments Public Acceptance

The is likely to be the main issue, at least for one of the sites. Offshore storage does not appear to be an issue in (our area).

This is a major issue, and politically contentious

Public awareness is almost non-existing.

Yes, there is much concern, mainly due to ignorance. Politically it is also correct to be hesitant, which underscores public concerns, i.e., political leaders do not take the lead.