REALISE CCUS

Call ID: LC-SC3-NZE-5-2019-2020

Demonstrating a Refinery-adapted cluster-integrated strategy
to enable full-chain CCUS implementation - REALISE

D4.1 - Critical review of EPE initiatives

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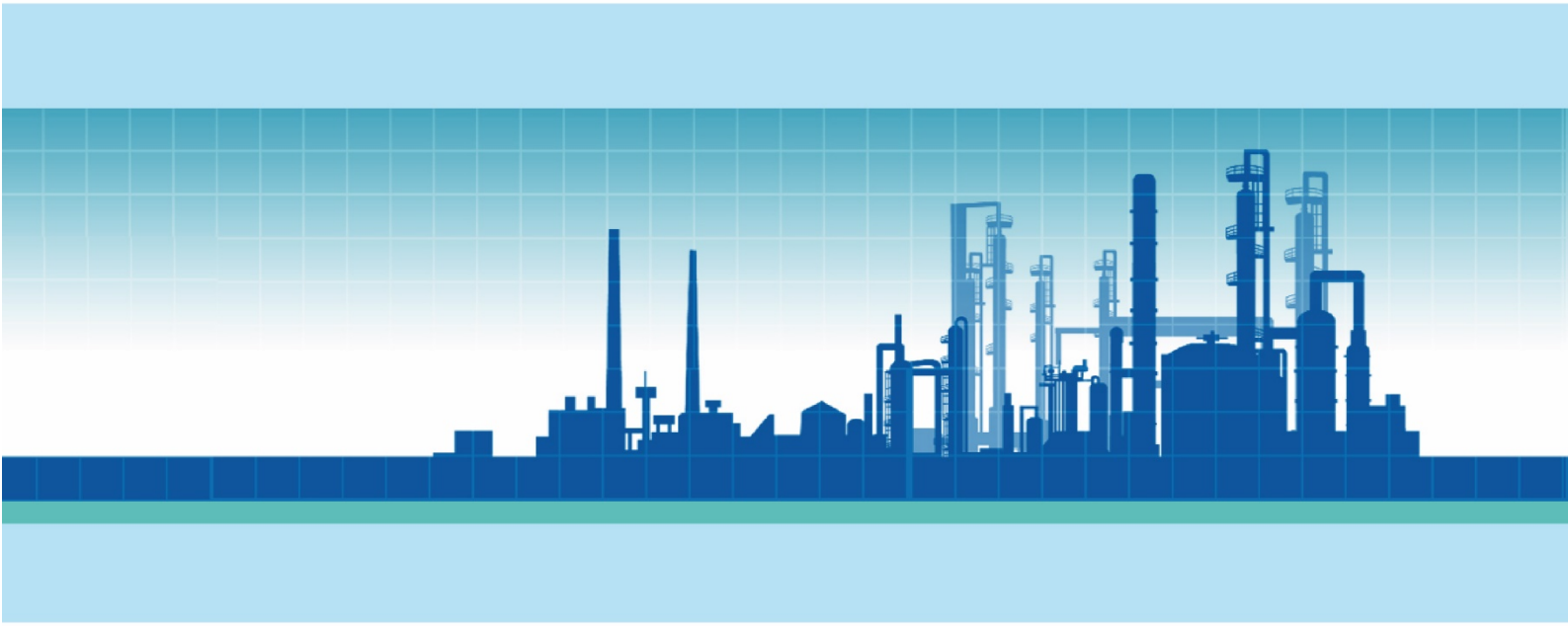

2021-02-09

Document History

Revision History

This document has been through the following revisions:

Version No.	Revision Date	Brief Summary of Changes	Name
1.0	08.02.2021	First internal draft issued for comments	Niall Dunphy

Authorisation

This document requires the following approvals:

AUTHORISATION	Name	Signature	Date
WP Leader or QA	Niall Dunphy	Niall Dunphy	10.02.2021
Project Coordinator	Inna Kim	Inna Kim	2021-02-12

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 884266

Disclaimer

Executive summary

This deliverable comprises a critical review of selected Education and Public Engagement (EPE) programmes from around the world. Information on selected case studies was gathered through a literature view combined with interviews of key informants. The methods used for EPE in each of the cases was identified, key challenges faced by such programmes identified, and best practices documented. The knowledge developed in this task and presented in this report will feed into the development of an Educational and Public Engagement programme within Task 4.2.

Table of Contents

Glossary

BIWF	Block Island Wind Farm
CCS	Carbon capture and storage
CCUS	Carbon capture, use, and storage
CO_2	Carbon dioxide
DAD	Decide, announce, defend (model of public engagement)
DADA	Decide, announce, defend, abandon
EIA	Environmental impact assessment
EPE	Education and public engagement
GDPR	General data protection regulation
NGO	Non-governmental organisation
RI	Readiness index
SA	Social assessment
WtE	Waste to Energy

1 Introduction

1.1 Background

REALISE is an EU Horizon 2020 funded innovation project, which aims to develop and demonstrate an integrated strategy for carbon capture, (use) and storage (CCS/CCUS) for the refining industry. The REALISE project plans to demonstrate a novel multi-absorber concept, which will enable the inclusion of small variable concentration sources. In doing so, it aims to capture up to 90% of CO_2 emissions from operating refineries, at a substantially reduced costs than existing capture methods. Cognisant that technical and social aspects are both important to the deployment of CCS (see e.g., Markusson *et al.*, 2012), REALISE not only evaluates the entire CCS chain from emitter to storage, but also considers the societal, socio-political and commercial aspects of novel technology deployment. The work presented in this report is a component of a package of work considering these socially orientated aspects of deploying the developed CCS technology. Specifically, this report focuses on approaches to engaging with the public on infrastructural deployment both that they may be informed, and crucially also that they may in turn inform the embryonic infrastructure projects.

Achieving climate neutrality of the EU's economy and society[1] is a central goal of the European Green Deal (European Commission, 2019). This envisaged decarbonization of Europe will require – amongst other things – the social acceptance[2] (and moreover the social acceptability[3]) of deployment of large infrastructure projects[4], including novel technologies such as CCS. Social opposition to large scale infrastructure will always be a potential issue, and communication between prospective host communities and proposed projects is therefore of the utmost importance. For instance, public opposition is a significant challenge in the siting of renewable energy developments, to the extent that it threatens to significantly slow down Europe's transition to more sustainable modes of energy production (e.g., see Cohen *et al.*, 2014; Enevoldsen & Sovacool, 2016). Indeed, the importance of engaging the public on infrastructural development has been highlighted by the EU Energy Roadmap 2050, which stated '*(t)he current trend, in which nearly every energy technology is disputed and its use or deployment delayed, raises serious problems for investors and puts energy system changes at risk'*

[1] It is noteworthy that the language used explicitly mentions both economy and society, emphasising in addition to changing techno-economic systems that we as citizens need to change the way we organise and live our lives.
[2] 'Social acceptance' with respect to infrastructure deployment, often implies (whether by design or otherwise) a passive acquiescence of a decision that has already been made. Such processes are usually concerned more with advocacy rather than decision-making. Linked to the traditional top-down so-called Decide, Announce, Defend (DAD) model (Cascetta & Pagliara, 2013), which due to the conflict frequently associated with such approaches (Wolsink, 2010), has been referred to by some as DADA - Decide, Announce, Defend, Abandon (Hunt, 2001, p. 223)
[3] 'Social acceptability' refers to the project itself, it infers an effort to design (and implement) a project to be (more) agreeable to social stakeholders. It suggests (and arguably requires) a more participatory approach, implying: acknowledgement of societal stakeholders' legitimacy, provision for them to be earlier, and understanding that they would provide real input into decision-making.
[4] Not to mention consent for the societal transformation both required by, and resulting from decarbonisation.

(European Commission, 2011 section 3.4). Such challenges of acceptability are also true for CCS deployment.

Carbon capture and storage (CCS) is widely seen as a key technology for mitigating climate change (Cremer, 2009; IPCC, 2014). In Europe, CCS/CCUS has been identified as a key technology breakthrough in the move towards a circular economy, as such it is designated as a priority area for the development of commercial applications under the European Green Deal (European Commission, 2019 Section 2.1.3). Praetorius and Schumacher (2009) conclude that CCS offers a cost-effective measure to reduce CO_2, which (given a supportive regulatory framework) should be included in a portfolio of measures[5] of a greenhouse gas mitigation strategy. While CCS likely offers environmental and economic benefits, there has been high-profile public opposition to particular developments, particularly in Europe (Desbarats *et al.,* 2010; Wallquist *et al.*, 2012). For instance, significant public opposition to the Barendrecht CCS project[6], near Rotterdam led to the project being cancelled (Limousin, 2010). In part, this outcome has been seen as a 'public engagement failure' (Brunsting, Upham, *et al.,* 2011; Terwel & Daamen, 2012), which others are keen to avoid. At the same time, good practices of education and public engagement have led to successful projects, like that of the Otway project in Australia and the Ketzin project in Germany (Mabon e*t al.,* 2013). Thus, it is increasingly acknowledged that social acceptance of will play a crucial role in the development and realisation of CCS projects *(Ashworth et al.*, 2009; Dowd *et al.,* 2014; Kraeusel & Möst, 2012; van Alphen et al., 2007).

1.2 Context

While once considered a wholly techno-economic domain, energy systems may be better understood as a socio-technical system, which '*are both socially constructed and society shaping'* (Hughes, 1987, p. 51). As Rip and Kemp (1998) observe, social processes may shape technology development, just as technological artifacts can influence changes in social and cultural practices. In this light, the energy socio-technical system can be conceptualised as a configuration of interconnecting technological and social elements including institutions, regulations, social practices, cultural values, beliefs and expectations (Einsiedel *et al.,* 2013). This deliverable was produced as part of work package 4 of the REALISE project, specifically with Task 4.1 '*Education and public engagement best practice*'. REALISE WP4 seeks to develop and in-depth understanding of the societal, socio-political and commercial contexts of CCS deployment.

Whilst the primarily focus of the planning and implementation phases of a CCS project might be on the technical and geological aspects – understanding the social characteristics of a potential host site and developing an appropriate education and public engagement (EPE) strategy can be an important factor influencing its successful rollout (Ashworth et al., 2009; Breukers e*t al.*, 2008; Reiner *et al.,* 2006). Understanding this importance, this deliverable is the outcome of a review of EPE around large infrastructure projects. This task is a preparatory exercise, which will directly inform the development

[5] Along with energy efficiency and certain other complementary mitigation measures.
[6] Barendrecht involved the storage of *c.* 9 million tonnes of CO_2 in a depleted gas field under a residential area.

of an EPE engagement programme (with associated performance indicators) within a subsequent related task, namely: T4.2. '*Social acceptability, societal impact.*'

1.3 Structure

In the following report, some key examples of EPE are identified through a combination of literature search and via networks of REALISE consortium members. A number of case studies are characterised through a desk study coupled with the use of targeted informants – detailing the nature of the project, its approach to public engagement, outlining challenges faced and detailing particular successes. The report is divided into five sections as outlined below:

- This first introductory section presents an overview of the report, details the background to the work, provides context for the task undertaken, and presents the structure of the document.
- The second section outlines the research methodology undertaken during the task, detailing the research philosophy adopted and describes the particular research methods adopted for data collection and analysis.
- The third section provides a brief overview of education and public engagement concepts and theories, and introduces public engagement on CCS
- Section four present summaries of seven case studies reviewed in detail during the task, including examples from CCS, energy and waste infrastructure projects
- The sixth section considers the education and public engagement conducted within these case studies, along with some complementary insights from other EPE programmes. Using information sourced from literature reviews and interviews with key informants, the experiences of engagement are explored, lessons drawn, and good practices identified.
- The final section comprises a conclusion, providing a summary of the key findings and recommendations to be incorporated in an EPE programme within Task 4.2.

2 Methodology

2.1 Introduction

This study aimed to develop an understanding of education and public engagement (good) practices and to identify and drawn lessons from prominent examples of EPE related to large-scale infrastructure projects, which would face comparable issues to a proposed CCS deployment.

As an initial step, a scoping exercise was conducted to select the case studies to be used in the study. Prospective candidates were identified through recommendations from REALISE consortium members and through a preliminary literature search. The inclusion criteria for the case studies were selected based on: (i) scale of proposed project; (ii) relevance to off-shore CCS deployment; (iii) diversity of

experiences; (vi) diversity in outcomes; (vii) availability of literature; and (vii) availability of potential informants.

This research was conducted through a literature review of relevant topics and (video-chat) interviews with key informants, with thematic analysis of interview notes, as outlined in the following sections.

2.2 Literature review

While often dismissed as a preliminary exercise, a precursor to 'real' research (Onwuegbuzie & Freis, 2016), reviews of literature are in fact a crucial part of the research process – whether framing subsequent research to be undertaken, or serving as a research method in its own right synthesising and integrating existing literature to develop new knowledge and insights (Torraco, 2005). In this study the objectives of the literature were twofold, namely, to develop an understanding of EPE programmes generally, and to characterise the selected EPE case studies in so far as possible. These objectives lent themselves to the definition of relatively narrow topics for review.

The bibliography databases used for the literature search were a combination of commercial services available through university subscriptions and those that were freely accessible – these included Science Direct[7], JSTOR[8], and Google Scholar[9,10]. Database searches were created using keyword search constructions comprising words, phrases and basic Boolean operators[11]. Such Boolean search combinations are quite flexible, and they act to make searches more precise. A 'backward' and 'forward' snowballing strategy was used to complement the aforementioned database searches. 'Backward snowballing' involved identifying literature contained in bibliographies of those papers already found; 'forward snowballing' involved identifying literature that cited papers already found[12].

The resultant list of literature was then screened to ensure that they are potentially usable – as Fink (2010, p. 59) puts it, that '*they cover the topic of interest, are in a language you can read, and are in a publication you respect and can be obtained in a timely manner.*' A further methodological screening (*i.e.,* considering quality of the work, quality of journal, author reputation, *etc*.) was undertaken to ensure the articles selected were suitable. While a study of this scope would not require an overly formalised (or indeed overly zealous) screening process, consideration of such attributes does result in a higher quality, more focused literature review, of a size manageable within the constraints of the project.

[7] www.sciencedirect.com
[8] www.jstor.org
[9] scholar.google.com
[10] The use of Google Scholar was notwithstanding some legitimate criticisms (see e.g., Jacsó, 2010) not least because of the power of its search algorithms, however it was used in full knowledge of its shortcomings and with the combination of other academic databases
[11] The three basic Boolean operators ['and', 'or', 'not'] connect words together to narrow or broaden results.
[12] Bibliographic databases provide such information to assist users

The details of the literature were inputted to the reference management software[13] used by the research team – this use of a database of references along with the cite-as-you-write plug-in for word processing made for a very user-friendly workflow enabling efficient reading, notetaking and organisation of documents. The review of literature itself comprised the familiar iterative process of searching, reading, annotating, organising, summarising, analysing, and finally synthesising.

2.3 Semi-structured interviews

The objective of semi-structured interviews is to understand the interviewee's perspective. Sufficient time and scope are allowed to facilitate interviewees talk about their opinions on a particular subject – allowing them to tell 'their story', albeit within the guiderails of the focal topic. The interview is treated as a conversation and the researcher tries to develop a rapport in so far as possible to encourage the conversation to flow (Gill e*t al.*, 2008). The interviews in this task complemented and supplemented the desk-based research, and they offered insights which would not necessarily have emerged through a wholly literature-based analysis. Potential interviewees were identified through a combination of the literature review and via introductions from REALISE consortium members and wider partner networks. Subsequently, candidate respondents were contacted by email and/or telephone call to introduce the project, to explain the particular study being undertaken, and to invite them to participate as key informants.

The restrictions associated with the COVID-19 pandemic meant that all interviews had to be held remotely. While this did reduce the effectiveness of the interviews somewhat, there were also advantages to such engagement. Potential respondents had increased availability[14], and because of this, geographical location was no longer a limiting factor, allowing us to spread our geographical spread. A total of nine semi-structured interviews were conducted with key informants who have specialist knowledge and experience of public engagement. Seven of these interviewees were associated with the selected case studies, while a further two are linked to EPE activities within the Cork area[15]. The nine interviewees came from Australia, Europe, North America, and South America, and were engaged using a range of teleconferencing technologies including Microsoft Teams and Zoom (depending on the interviewee's preferences).

The semi-structured interviews were carried out using pre-formed, concise, easily understood, open-ended questions – the informants were invited to talk about the particular case study (or EPE activities), with which they were familiar. Prompts were used to guide the conversation including *e.g., o*perational queries around the approach taken to public engagement, how they built relationships with local stakeholders, how the engagements were actually structured (whether they were formal, informal, or a combination of the two), what were the main concerns of local people and how were those issues

[13] Mendeley Desktop
[14] As many of them were working for home, and frequently appreciated the opportunity to have a conservation with people from outside their reduced social circle.
[15] As the Cork Harbour area in Ireland is due to be the focus for the development of the EPE programme in T4.2

addressed, what types of information were shared with local stakeholders, did consultation fatigue set in and how did the process leader address this, and given their experiences on the project what would they change or do differently. Extensive notes were taken during the interviews (including non- verbal communication as appropriate[16]) – calls were recorded where technically possible (and when permission was given) and these recordings were used to supplement and enhance the notes – the interview notes were analysed as described below.

2.4 Data analysis and interpretation

The aim of analysing qualitative data, such as interview notes, is to make sense of, to interpret, and to theorise data (Schwandt, 2007). It involves working iteratively back and forth between data and ideas using analytical categories are used to describe, characterise and explain social phenomena (Pope *et al.*, 2000). It is a recursive, laborious and frequently time-consuming process that can result in quite rich understandings. In this study, the data analysis of each interview began with a read-through of the extensive notes taken during the discussion; this was repeated a number of times until the material became familiar to the analyst[17]. Following this initial stage, the text was analysed line-by-line to capture key information about their projects and to identify themes relevant to public engagement activities. The first part of this exercise involved cross-referencing information with that from academic literature and publicly available documentation, filling gaps in knowledge, resolving inconsistencies, and as required identifying additional information needs. The second part involved using standard thematic analysis procedures to systematically order, categorise and label text through a process known as coding – with identifying codes[18] applied to the relevant proportions of text. In such analyses, it is common for qualitative data analysis software (such as NVivo) to be used to facilitate coding, organising, linking and cross-referencing of material, however the size and complexity of the study facilitated coding by hand. It also greatly abbreviated the iterative analysis and interpretation process. In each case the researcher who interviewed the respondent also analysed the notes. The researchers involved, coordinated their activities and jointly reviewed their work.

[16] While not as effective as face-to-face interviewing – the ability to video chat with people (who in a pre-Covid context would likely not be amenable to such a mode of communication) did enable the capturing of non-verbal communication such as gestures, facial expressions, *etc*. which did differentiate the interview from traditional telephone interviews for example.

[17] In each case the researcher who interviewed the respondent was also analysed the notes.

[18] Saldaña (2013, p. 3) describes a code as '*most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data*'

3 Education and public engagement

3.1 Why engage with the public?

Over the past few decades, education and public engagement (EPE), and participation in environmental decision-making has come to form a significant part of many environmental regulatory and planning systems world-wide. Education and public engagement with environmental decision-making has been shown to assume a variety of forms: public hearings, education, information dissemination, public advocacy and advisory or review boards, to name but a few (Richardson & Razzaque, 2005).

Halliday (1993) describes a shift from a 'decide-announce-defend' (DAD) approach to 'consult-consider-modify'. This latter approach requires democratic decision-making, rather than technocratic and corporatist-style deliberation, as well as open-mindedness that allows multiple views, rather than single, closed-ended projects (Wolsink, 2007). Participation is becoming important not only for the implementation of certain projects, but also for improving the image of the industry and widening its public support (Aitken *et al.*, 2016).

This growth of participation in decision-making, has resulted from a number of interrelated factors, including: the growth of human rights in legal and political systems; increased international interest in the application of participatory mechanisms to address concerns for 'good governance'; and reduced trust in governments and perceived legitimacy of the state (Richardson & Razzaque, 2005). Stakeholders (including societal stakeholders) impacted by decisions relating to infrastructure development, land use plans, pollution licences, *etc*. now expect transparency and accountability relating to such decisions, and demand increased public consultation. Fiorino (1990) distinguishes three main rationales for public engagement, namely:,

- Normative: public engagement should involve those individuals who have a stake in the decision (*e.g.,* communities impacted by decisions; voters in the case of public funded projects; *etc.*);
- Substantive: public engagement can improve the quality of decision-making by drawing on diverse knowledge and values;
- Instrumental: public engagement may be used with a specific goal to raise public awareness, increase risk or product acceptance, or foster trust in experts, developers or government (Whitmarsh *et al.*, 2019, p. 2).

As Smith, Stirling and Berkhout (2005, p. 220) summarise: '*under a normative view, participation is just the right thing to do. From an instrumental perspective, it is a better way to achieve particular ends. In substantive terms, it leads to better ends.*'

3.2 Levels of participation and engagement

EPE takes on a variety of forms which have been analysed over the years using a number of different frameworks. One framework to engagement distinguishes between "top-down" and "bottom-up"

participation and communication approaches, the former initiated by the government, the latter initiated by communities themselves (Langton, 1978, as read in Richardson & Razzaque, 2005). Other models distinguish between *substantive* and *procedural* dimensions of participation, though these are often intertwined (Ebbesson, 1992, as read in Richardson & Razzaque, 2005).

Arnstein's (1969) taxonomy of participation is a useful perspective on engagement. In her seminal article she forwarded the so-called 'ladder of participation', shown in Figure 1, divided into three categories of non-participation, tokenism and citizen power. These categories are further divided into eight levels of participation ranging from manipulation at one extreme, to citizen led at the other as described below.

The first two levels (**manipulation** and **therapy**) do not entail any participation, the aim is to achieve support through public educating and persuading citizens.

The third step, **informing** is important, however too often it is a one-way communication, with feedback (implicitly or explicitly) unwelcome. Consultation goes somewhat further reaching out to communities, holding briefings, conducting surveys, *etc.*

Placation sees citizens being able to advise and contribute to planning, but with no real power, decision making is still fully retained by those that hold the power. Partnership on the other hand sees actual sharing of power with real decision-making responsibilities being given to citizens.

With **delegation**, citizens have the majority voice on decision making bodies, and so they can be assured of responsiveness. While **citizen led** is where the actual programme or institution, *etc.* is fully governed by the citizenry (*e.g.,* through a local co-operative).

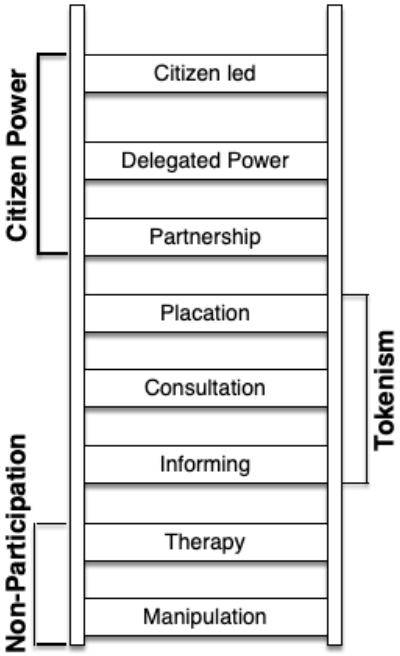

Figure 1: Ladder of participation. Adapted from Arnstein (1969)

3.3 How to engage

Early and proactive engagement is one of the most critical considerations to avoid attitudes becoming polarised in the discussion on CCS. Coyle (2016) found that the timeliness of the processes used to engage communities were a key factor in the success of CCS projects, and that essentially "it is never too early to engage". CCS projects which have suffered due to delayed engagement of the public, such as that of the Barendrecht in the Netherlands (Brunsting, Upham, *et al.*, 2011) have highlighted the need to move public engagement "upstream" to where stakeholder engagement is initiated before a crisis point has been reached and issues become problematic (Coyle, 2016). Early public engagement has been hailed as a factor in the success of numerous energy infrastructure projects, the CO2CRC's Otway project in southwestern Australia and Deepwater Wind's Block Island Wind Farm in Rhode Island, USA, to name a few (Dwyer, 2016; Dwyer & Bidwell, 2019; Steeper, 2013).

In the same way, a professionalised set-up and high level of formality can make it difficult for people to engage with the process who are not familiar with, or confident engaging in, these sorts of settings (Fitzpatrick & Sinclair, 2003) – creating more informal settings can thus increase levels of participation (Brody *et al.*, 2003). Furthermore, consideration should also be given as part of a CCS public engagement strategy to the history of the area in question – whether the area has past experience with CCS, other energy infrastructure projects or the fossil fuel industry, as well as whether those experiences have been positive or negative (L'Orange Seigo *et al.*, 2014). In the case of CCS, few areas will have direct experience with the technology, however other related technologies, like fossil fuel extraction or underground gas storage, may also help shape perceptions of CCS (L'Orange Seigo *et al.*, 2014) if the public believe that the technology fits with the identity of the particular place. Boyd, Hmielowski and David (2017), for example, found that while most Canadians were not fully supportive of deploying CCS as a technology to mitigate carbon emissions, those living in Alberta and Saskatchewan, areas with experience of the fossil fuel industry and a higher dependency on coal, were more likely to support CCS.

3.4 Centrality of trust

Understanding how to build trusting relationships between the public and project developers and process leaders is crucial for bridging relationships and promoting positive opinions of the information source, thus encouraging acceptance of a development (Mandarano, 2015; Ricci *et al.,* 2010). The question is often raised of how trust comes about in the first place, or how to build trust among stakeholders. Public engagement has therefore become widely recognised as a key mechanism for enhancing trust (Bloomfield *et al.,* 2001; Brunk, 2006; Denhardt, 2002; Petts, 2008; Stebbing, 2009; Wang & Van Wart, 2007; Wynne, 2006).

Natarajan *et al.* (2018) highlighted how citizens impacted by renewable energy infrastructure projects in England and Wales reported feeling ignored by developers, and developers themselves appeared uninterested in local views and engaging in dialogue (here the approach would seem to align with the lower rungs of Arnstein's ladder). There was a strong and persistent perception by local people that the process privileged the developer, who was perceived as having much greater resources than them and potentially being able to "game" the system, taking advantage of the process and twisting evidence to suit their needs. The perception of the developer's position within the process reduced other stakeholders' trust in the project, regardless of their views on the development. This was highlighted by the fact that interested parties continued to worry about the position of the developer even after decisions on mitigation measures and changes to the development had been made. Locals consistently questioned whether the developer would follow through on the agreed-upon protections, with some stakeholders continuing to track the project process after agreements had been made in order to ensure that conditions were complied with (Natarajan *et al.,* 2019).

Mayer, Davis and Schoorman (1995) identified three factors of trustworthiness, which Gillespie and Dietz (2009) applied to the organisational context as: *integrity* (actions that adhere to moral principles); *benevolence* (actions which show concern for the stakeholders' well-being); and *ability* (how competent the organisation is perceived at functioning reliably and effectively in order to meet its goals). The

existence of these three factors determines the level of perceived trustworthiness of an organisation – trust can thus weaken through a lack or decline of these factors (Mayer *et al.,* 1995). Apart from the three main factors of trustworthiness, trust also needs time to grow and develop. A 'spiral of rising trust' (Fox, 1974 as read in Kougiannou & O'Meara Wallis, 2019) can be generated by repeated actions indicative of trustworthy behaviour: trust is said to positively develop over time as long as individuals decide to reciprocate cooperation, though it drastically declines if the other party decides not to reciprocate (Axelrod & Hamilton, 1981; Lewicki et al., 2006).

However, a positive outcome cannot always be guaranteed through public engagement, indeed, ineffective public engagement may build distrust (GuideStar, 2008). While numerous barriers to effective engagement also exist, including time constraints, pre-existing public distrust, poor access to information and communication technology and a low level of public awareness on the issue (Lorenzoni, Nicholson-Cole and Whitmarsh, 2007), as pointed by Xenias and Whitmarsh (2018), the way the and the level in which the public is engaged can have significant implications for the outcomes of these processes.

3.5 Public engagement on CCS

Public engagement with CCS is important for a range of reasons. From one point of view, it may serve to mitigate public opposition to developments – for example, those seen in Barendrecht. However, there are also reasons of democratic governance and decision quality that argue in favour of public views being considered (more fully) in CCS decision-making (Xenias & Whitmarsh, 2018). Public engagement and participation on decisions relating to the environment, or similarly, large energy infrastructure projects helps decision-makers to understand, identify and address public interest concerns, thus taking environmental and social considerations into account as part of the decision-making process (Richardson & Razzaque, 2005).

Recent research has showed that a number of different, yet related factors influence whether the public will show support or acceptance for a technology such as CCS. These can be summarised as:

- how information about CCS is framed,
- trust in the actors promoting CCS,
- level of the participation in the engagement process.

3.5.1 CCS framing and interest aligning

Framing and interest aligning can be key factors that shape publics perceptions about CCS. Because CCS is a technology that is relatively unfamiliar to the public, perceptions of CCS can be heavily influenced by the information and framing provided by those deploying CCS projects (Whitmarsh *et al.,* 2011). Therefore, it is worthwhile to tailor education and public engagement strategies for CCS if a higher social acceptance is required.

Early research into CCS found that public concern about climate change and the perception of CCS as part of a broader solution to climate change were key elements influencing public acceptance of the technology (Sharp *et al.,* 2009), with the success of a CCS project often linked to the views held by the

public of its capability to decrease carbon emissions at an industrial scale (IEA, 2013; IPCC, 2014). For instance, Boyd, Hmielowski and David (2017) found that belief in climate change (*i.e.,* that climate change is occurring) was a factor correlating with support for CCS, with those holding the belief that climate change is a problem caused mostly by humans more likely to support the technology. However, support for a technology at the abstract level does not automatically mean support for an individual project, where local concerns will come to the fore (Mullally *e*t al., 2018)[19].This would indicate that care should be taken to adequately understand local perspective and address local concerns.

Conversely, concerns have also been raised that CCS is not environmentally sustainable, does not tackle the root of the problem and can be viewed as simply "sweeping the issue under the rug" all the while reducing investments in renewable energy technologies (L'Orange Seigo *et al.,* 2014). Research has shown that framing CCS as a bridging technology that will not reduce investments in renewable technologies can address these concerns and can have a positive effect on people's attitude towards the technology. Wallquist *et al*. (2011) quantified the effects of framing CCS as a bridging technology, measuring the effects on risk and benefit perceptions in study participants. The study found that the participants benefit-perceptions increased, and risk-perceptions decreased after they were provided with a paragraph to read on how CCS is only part of the solution to climate change and should be embedded in a range of other low-carbon technologies.

This knowledge suggests that consideration must be given to the public's perceptions of environmental problems when communicating issues regarding technologies such as CCS (Corner et al., 2014; Nisbet, 2009). Providing the public with evidence that the technology can be an effective instrument for achieving significant cuts in carbon emissions, as a transition technology to offer time for the further development of renewable energy technologies, could play a crucial role in promoting public acceptance of CCS (Paluszny *et al.,* 2020). In such a discourse, it is important that a government is not perceived as having a special interest in a particular energy strategy bias, *e.g.,* promoting CCS over renewable energy technologies, and that the public will be involved in the debate on the technologies to be implemented (Oltra et al., 2010).

3.5.2 Trust in actors promoting CCS

Trust in the actors promoting CCS is a crucial factor determining local stakeholder's inclination to protest, risk and benefit perception (Brulle *et al.,* 2012; Earle & Siegrist, 2008; Midden & Huijts, 2009; Terwel et al., 2011; Terwel & Daamen, 2012; Yang *et al.,* 2016), and has therefore been recognised as a key influencing factor in the success or failure of CCS, or indeed, any energy infrastructure project.

For instance, people's evaluations of the value of the information provided depends to a considerable extent on the trust towards who provides the relevant information (Ter Mors *et al.,* 2010). Perdan *et al.* (2017) showed that universities and research institutions are the most trusted sources of information about CCS while energy companies and social media are the least trusted. Trust in non-

[19] Such concerns are commonly attributed to so-called NIMBYism (not in my back yard), while occasionally examples of this can be found, it is more often lazy analysis and sometimes even a strategic allocation of blame to those that hold opposing views (see for example, Wolsink, 2006).

governmental organisations (NGOs) is also high, meaning that local people tend to prefer to engage with them in the decision-making process than with industry and the government (Eurobarometer, 2011; Terwel et al., 2011). Local research projects tend to face the least opposition from local stakeholders and are thus more likely to be successfully implemented than projects run by foreign energy companies, which commonly face strong opposition and cancellation (Oltra e*t al.,* 2012). Nonetheless, when trust in industry and government is high in a particular context, attitudes towards CCS appear to be more positive (Oltra *et al.,* 2010).

Rousseau *et al.* (1998, p. 395) describe trust as a "*psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another*". The multi-faceted nature of trust makes it a complex concept. A number of studies (e.g., Poortinga & Pidgeon, 2003) have distinguished and assessed various dimensions of trust, for example, trust in motives (Hardin, 1996), trust in competence (Mayer et al., 1995) and trust in transparency (Frewer et al., 1996). Other key attributes of trust which research has identified include integrity, competency, transparency, fairness, care, credibility, responsiveness, openness and reliability (Denhardt, 2002; Poortinga & Pidgeon, 2003; Upham & Shackley, 2006).

Numerous studies have explored the complex relationship between trust and citizen engagement, with some describing it in terms of a "virtuous circle" (Jennings & Stoker, 2004) *i.e.,* those who have more trust tend to engage more, but also those who engage more have more trust. Some studies (Tsang et al., 2009; Uslaner & Brown, 2005) support the first assumption that trust can affect citizen engagement in various forms, whereas others (Kim & Lee, 2012; Tolbert & Mossberger, 2006; Wang & Van Wart, 2007) support the latter notion that citizen engagement affects trust.

In the context of trust and citizen engagement, a distinction can be made between internal efficacy and external efficacy. Internal efficacy focuses on the confidence citizens have in themselves and their ability to understand and influence a process – when this is high citizens are more likely to engage with and trust decision-makers *e.g.,* the government. Conversely, with external efficacy, citizens have confidence in the responsiveness of the decision-makers to their engagement, and engage more because they are more trusting of these decision-makers (Anderson, 2010; Corrigall-Brown & Wilkes, 2014). External efficacy has been proposed as the greater predictor of citizen engagement (Siebers *et al., 2017)*, thus it is imperative that the building of trusting relationships between stakeholders and decision-makers is encouraged.

Studies of trust within CCS organisational contexts have revealed that people are more likely to feel fairly treated if they are allowed to present their suggestions and participate in the decision-making process (Tyler, 2000), yet this opportunity is only valued and appreciated if the people trust the authorities tasked with considering their opinions (Tyler, 2000; Tyler & Lind, 1992). Furthermore, research by Terwel and Daamen (2012) indicates that, apart from a few individuals who are directly involved in the topic of CCS, the vast majority of lay people will not have the motivation to explore this area further. Thus, lay people are more likely to form their opinions about the technology based on heuristics and systematic and random bias *i.e.,* their attitudes and preferences towards CCS will be influenced by their subjective trust. Because knowledge is low, the public's opinions of, and trust in, the source of expertise in such a scenario are likely to determine the value they place on the information

provided to them and how the message these actors are trying to convey is received (Koot *et al.,* 2016; Ter Mors *et al.,* 2010; Vercelli *et al.,* 2013).

Trust can be engendered in a number of ways, through direct interaction with experts and developers via citizen panels as well as through substantive and early engagement of communities in the decision-making process (Terwel *et al.,* 2011). For instance, Huijts, Midden and Meijnders (2007) found that trust in a stakeholder, such as a project developer, is often influenced by the perceived similarity with that stakeholder. Coyle (2016) concluded as part of her research into deliberative engagement around the siting of a CCS facility in New Zealand that a Māori liaison officer should be hired by a future CCS company looking to develop in the region in order to ensure that engagement is initiated in a culturally appropriate way that encouraged, rather than threatened, the establishment of trust among stakeholders.

3.5.3 Contrasting visons of CCS EPE programmes

Approaches to Education and Public Engagement (EPE) can profoundly influence community perceptions of CCS (Brunsting et al., 2013; Buhr & Wibeck, 2014; Dütschke, 2011; Oltra *et al.*, 2012). Heuristically, albeit simplistically, EPE programmes can usefully be categorised into two contrasting approaches (see also Section 3.2). The first approach is top-down, hierarchical, non-participatory approach which utilises one-way communication channels, and offers 'community benefits' decided by the developer. In contrast, the second approach is more participatory involving two-way communication channels, not just welcoming, but actively seeking feedback from the public. Citizens are invited and facilitated to become involved in decision-making processes. These contrasting approaches are outlined below.

(i) Top-down, focus on information provision

It is still common practice to employ a top-down, technocratic, and hierarchical way of thinking when shaping wind farm planning systems (Wolsink, 2007). These include Environmental Impact Assessments (EIA) or Social Assessments (SAs) that follow national regulations (if existent), or standards proposed by international financial institutions that are required as part of the procedures for obtaining funding for the project. These assessments frequently involve an expert diagnosis of socio-cultural contexts and aim to facilitate the incorporation of social issues into project planning, implementation and monitoring. These evaluations can also provide a social baseline to address threats to the reputation of the project and its sponsors (Ledec *et al.,* 2011).

Outcomes of one-way assessments and planning usually define community benefit packages that provide payments to compensate local communities affected by CCS (Bonham *et al.,* 2014). The assumption by policymakers is that the provision of community benefits based on financial incentives will aid in promoting social acceptance for CCS (Cowell, 2010; Cowell *et al.,* 2012). However, Bell *et al.* (2005) explain that the financial incentive strategy can result in the alienation of people if they feel that they have not been offered what they consider to be fair. Moreover, Wolsink (1994) describes this strategy as dangerous since payments can be seen as a bribe, especially when offered at a stage when there are already disagreements between developers and communities. This can be particularly problematic if incentives are targeted to '*economically vulnerable and politically weak communities*'

(Luloff, Albrecht and Bourke, 1998: 864). Thus, it is unclear whether financial incentives are an effective way to increase local support in settings in which bribery and corruption are prominent practices. This suggests that local communities' acceptance is more effectively secured through 'procedural fairness, as opposed to material (or outcome) fairness' (Walker *et al.*, 2017). As seen in the previous section, often the public does not trust politicians, developers or experts (Breukers & Wolsink, 2003; Healey, 1996), and as such, information is frequently seen as 'suspect' in a climate of mistrust. Meaningful participatory processes have thus become a means of building trust for greater community engagement and acceptance.

(ii) Participative approach

For relevant stakeholders to be meaningfully engaged in a CCS project, community, developer and government interactions cannot be one-way. 'Participation' has been denoted as a more significant component of the engagement of local communities, particularly when stakeholders actively take part in defining and implementing the project in question (Coyle, 2016). The underlying assumption is that greater public participation in decision-making processes will lead to more legitimate, socially sustainable outcomes (*e.g.* Buchy and Hoverman, 2000; Chilvers, 2008).

Participation as a right and an approach for community development can be further applied as a form of awareness-raising, consultation and/or empowerment (Arnstein, 1969). Raising awareness, although it can help improve understanding on particular issues, can also be a minimal form of community engagement when conducted on its own. Accordingly, consultation requires a two-way flow of information as it encourages the public to voice their views and interests to inform decisions. Yet, it does not necessarily address the public's concerns in practice nor in planning strategies (Bell *et al.,* 2005; INVOLVE, 2004). Thus, it is widely recognised that consultation works best when it presupposes meaningful interactions, and participants' perspectives are included in planning and operation decisions (Aitken et al., 2016). In contrast, empowerment, involves power and benefit-sharing among all stakeholders and the wider society. This approach can take the form of community-led engagement where community members determine objectives, define processes (Rowe & Frewer, 2005; Wilcox, 1994), or chose partnership approaches (INVOLVE, 2004).

However, is important to note that well-crafted participatory processes do not necessarily lead to greater rates of public acceptance and engagement. There is evidence that two-way community engagement can reduce social opposition, yet, it cannot be seen as a way to secure project approval and execution (Aitken *et al.*, 2016). Participation is not enough to fully address the political implications, power inequalities between groups, and heterogeneity of stakeholders (who speaks for the public and how?) (Fournis & Fortin, 2017; Haggett, 2010). Moreover, participation power is rarely completely devolved onto the 'community'; nor do 'communities' always want it (Cornwall & Jewkes, 1995).

Selecting appropriate approach

This review of the literature on the link between EPE and social acceptability reveals that there are no set guidelines for increasing social acceptance of the kind that also pursues larger goals such as community development. The first level—one-way social assessments and community benefits—may be useful for sites located in unpopulated areas, as it implies public nonparticipation. The second

approach—a two-way public engagement initiative—has been somewhat successful in attaining social acceptance, but decision-making processes may still have degrees of tokenism to overcome.

A number of factors, some intentional and some unintentional, can contribute to encouraging the public to perceive processes as a one way or two-way process. For example, one particular study by Natarajan *et al.* (2018) analysing stakeholder opinions of the public consultation process for "Nationally Significant Infrastructure Projects" (NSIPs) demonstrated a clear split in perceptions of developer engagement with the various stakeholders. Local residents highlighted many issues with the public consultation process, namely that communications were one-way, developers didn't seem enthusiastic about engaging in dialogue with locals, and that the communications process could at times be unfair where the developer was perceived as not "playing by the procedural rules" (Natarajan *et al.,* 2018). Local residents perceived themselves as having low levels of influence over the project (42%), though this was mirrored by only 19% of other actors, suggesting that the lack of influence of the public, the subject of so much research, is not perceived equally by all stakeholders (Natarajan *et al.,* 2018). In this same study the public perceived that events were organised to be logistically difficult, thus limiting input from the public. Misleading information was taken to be deliberately confusing, with respondents taking this to mean that the developers were *'trying to pull the wool over our eyes'*. These issues gave the impression that a decision to grant permission for the project had already been taken, and that public input was not welcome, though this may not have been the intention of the developer (Natarajan et al., 2018).

Furthermore, the perception of "not being heard" in the public engagement process can go beyond being involved in the formal consultation and examination processes and may extend to other less obvious issues, such as the public's inability to read subsequent reports on decisions made, which increases the sense of frustration held by the public (Natarajan *et al.,* 2018). This is echoed in the fact that absence of protest over a proposed project doesn't imply that the local population is happy or accepting of such a project – they may simply feel that their voice would not be heard even if they protested (L'Orange Seigo *et al.,* 2014). Processes whereby there is an onerous level of resourcing required to participate, as well as those which are not flexible and subject to strict timelines, can make participation difficult for many members of the public (Natarajan *et al.,* 2018). Furthermore, certain aspects of the public engagement process, such as a reliance on digital channels of communication, can cause concern for particular groups of stakeholders and may result in some stakeholders perceiving the process as unfair while others do not have any issues. For example, Natarajan *et al.* (2019) found from focus-group discussions that some stakeholders struggled with the use of online resources for engaging with the NSIP process, and a wider range of communication methods would have been preferred. Those who were not computer-literate found the use of online resources intimidating, and even for those who were IT-literate there were challenges given the large volumes of documentation and high download capacities thus required in order to be informed of the process. As these issues were experienced by some but not all stakeholders the engagement process could not be considered fair by all (Natarajan *et al.,* 2019).

4 Summaries of case studies

(1) CO_2CRC Otway Project, Australia

Overview

The CO_2CRC Otway Project is a small pilot CCS demonstration and research project situated in south-western Victoria, Australia. The demonstration project, which has been operated by the national CCS research institute, the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC), since 2009, is considerably smaller in its injection volume compared to commercial-scale CCS projects (Ashworth et al., 2010; Lockwood, 2017). The project is now a leading facility for ongoing research on carbon dioxide injection, transport, storage, monitoring and verification, and community engagement, and supports research into CCS technologies from the pore space to the regional scale (Steeper, 2013). The project is situated off the Great Ocean Road between Nirranda South and Curdievale and borders the shires of Moyne and Corangamite, 228 km south-west of Melbourne. Between 2006-2008, the population of the Moyne and Corangamite Shires were estimated at *c.* 16-17,000 people. Both shires are characterised as rural districts with long standing farming heritage in dairy, sheep and cattle grazing, as well as general agricultural activities, among other service industries and some tourism. The local Moyne community is a traditional settlement, sometimes considered to have parochial and conservative attitudes, and is characterised by a close-knit rural community underpinned by generational land ownership. Local people tended to be knowledgeable about land and environment issues, and played an active role in the CO_2CRC Otway process, researching internet and other sources of information in order to become more informed about various aspects of the project (Ashworth et al., 2010).

The locals also had previous experience dealing with proposals for wind farms and oil and gas exploration (Lockwood, 2017). The ongoing success of the CO2CRC Otway Project has been attributed to the support of the local community, particularly the landowners surrounding the project (Steeper, 2013).

Project summary

Company: CO_2CRC (Cooperative Research Center for Greenhouse Gas Technologies)
Location: Nirranda, Otway Basin, Southern Australia
Duration:
Pilot (concept) 2008–2009
Stage Two (risk reduction) 2009–2019
Stage Three (cost reduction) 2016–present
Size: 65,000t CO_2 injected (pilot)
CO_2 Source: Buttress production well (natural deposit)
Storage: Depleted gas reservoir (2000m depth)
Status: Stage Three ongoing
Cost: $40 million (to December 2011)

Engagement strategy

Conceived in 2005, stakeholder consultation has been a strong focus of the project process from the outset (Steeper, 2013). Once the project site was selected, stakeholder mapping and community engagement began. Initially, one-on-one discussions with landowners eventually progressed to large public information meetings. Early engagement highlighted the need for project leaders to establish a better understanding of community attitudes and expectations towards the project (Steeper, 2013). A number of critical factors have been identified as having contributed to the success of the project to date. They include:

- A well-structured communication plan;
- Established baseline of knowledge and attitudes towards CCS in the local community;
- Early, proactive engagement;
- Hired Community Liaison Officer;
- Formed Community Reference Group;
- Devised protocols for engaging local landowners;
- Community benefit plan devised in conjunction with community.

(2) Jänschwalde CCS Project, Germany

Overview

Jänschwalde was designed as one of the most advanced CCS projects in the world. Owned by Swedish company Vattenfall, the Jänschwalde power plant is located approximately 120 km southeast of Berlin, in the state of Brandenburg. Vattenfall announced in 2009 its plans to explore CCS through a demonstration project at Jänschwalde, scheduled to begin operations 2015. The project would have been responsible for permanently storing 1.7 million tonnes of CO_2 per year. The project saw difficulties regarding public acceptance from its inception, and Vattenfall eventually cancelled the project in 2011 (European CCS Demonstration Project Network, 2012; European CCS Demonstration Project Network, 2010).

Large infrastructure projects in Germany have a reputation for resulting in a lot of opposition, whether they be wind farms or the construction of transmission grids. As CCS is not perceived as a "green technology" in Germany, but as an excuse for utilities to carry on using fossil fuels, it was anticipated that the Jänschwalde project would cause a stir in the community, thus making gaining public acceptance a key target from the project outset (European CCS Demonstration Project Network, 2010).

CCS was facing growing opposition in Germany at a similar time to the declining relations at the centre of the Barendrecht project in the Netherlands. Significant influence can be attributed to public outreach failures, NGO activism, regulatory uncertainty and the complex interplay of politics at national and state levels. Vallenfall's proposed Jänschwalde plant has received a lot of attention in analyses of outreach failures in Germany, mainly because Vattenfall appear to have been quite conscientious in their outreach approach yet the proposed project may have been affected by the mounting national mood against CCS in Germany (Lockwood, 2017).

Project summary

VATTENFALL

Company: Vatenfall

Location: Jänschwalde, Brandenburg, Germany

Duration: 2008–2011 *Size*: 1.7 million t CO_2

CO_2 Source: coal power plants

Capture technology: Ammonia

Storage: enhanced oil recovery (EOR)

Status: cancelled

Cost: €1.5 billion (if it had been completed)

Engagement strategy

Vattenfall expected a certain level of opposition to the proposed CCS demonstration project, and carefully planned their public engagement strategy in order to mitigate any negative feelings towards the project.

The public engagement strategy aimed to establish a local dialogue on CCS at an early stage in the project process.

The developers put together a dedicated communications team of seven people, who worked closely with all aspects of the project and reported back to the process leaders on key developments.

Factors influencing social opposition

Vattenfall underestimated the level of local opposition to the proposed storage area in Beeskow, an area with no history of coal production and where national utilities were not trusted by local people. The primary factors that influenced local opposition included:

- Poor public outreach from earlier projects, notably the Hürth Plant proposed by RWE in 2008;
- Influence of state elections;
- Low awareness of CCS technologies.

(3) San Cristóbal Mine, Bolivia

Overview

The mining industry has been a significant part of the Bolivian economy since the mid 1500s. The extraction of silver, zinc, lead, tin, gold, copper, tungsten, sulphur, potassium, borax, and semi-precious stones, as recently as 2017, accounted for 28% of Bolivia's exports and an annual income of some $2.2 billion (SelectUSA.gov, 2019). In 1995, Apex Silver Mines found a large mineral deposit near the village of San Cristóbal, which would turn out to be the largest silver discovery of the 20th century. After securing the rights, the Sumitomo Corporation established a subsidiary mining company, Minera San Cristóbal (MSC), which soon realised much of the village was located on lands the future mine would occupy and would therefore need relocation. The project would therefore require a largescale and thorough engagement programme, given the community was being asked to take on significant change to facilitate the mine development.

Prior to 1995, the residents of San Cristóbal were described by Boutilier and Thomson (2019) as living in a subsistence economy, i.*e*. living a traditional campesino lifestyle of self-sufficiency based on small scale agricultural production, largely for personal consumption. The town in 1995 had a permanent population of just 35 families. Planning and construction of the mine required an in-depth engagement process to ensure decisions made about the relocation of the town and the development of the mine were mindful and response to the community's concerns. This engagement process has documented by Boutilier and Thomson (Boutilier & Thomson, 2019), who carried out a retrospective study detailing the fluctuating levels of social acceptance that occurred prior, during, and after the development of the large mining project. They also noted the intergenerational shift in attitudes towards the mine by the local community and the tensions that arose as a result of these and other external factors. While not a CCS project, it offers a number of insights into how largescale projects engage in EPE and the issues that can arise from such activities.

Project summary

MINERA SAN CRISTÓBAL S.A.

Company: Minera San Cristóbal S.A. (Sumitomo Group)

Location: Campamento Toldos Provincia, Bolivia

Duration: 2000–present

Size: 231 million tonnes of open-pittable proven and probable reserves

Mineral extraction: silver, lead, and zinc

Production: 1,300 t of zinc-silver and 300 t of lead-silver concentrate per day

Number of employees: 1,400

Status: In operation

Engagement strategy

Two distinct timelines

1995–2008: Public engagement during this period primarily involved multiple consultations and discussions in a stakeholder forum-style committee. In addition, a detailed education and support programme was developed by the company to benefit local residents. After a breakdown in communication (due to structural changes in company personnel) efforts to regain trust and re-establish lost relationships were intensified with job fairs targeting local people, and recruiting local women to training and upskilling programmes.

2008 to present: MSC put in place a formal grievance mechanism and regularly updates its mapping and analysis of stakeholder networks. It also has a number of regional offices operated by community liaison officers, who engage with local people day-to-day. It also follows Social License to Operate (SLO) principles, though as Brueker and Eabrasu (2018).

(4) Block Island Wind Farm, USA

Overview

The Block Island Wind Farm (BIWF) was the first commercial offshore wind project to be constructed and operated in the United States. The 30MW five-turbine project is located approximately 6kms southeast of Block Island, Rhode Island. Block Island is a popular tourist and getaway destination, with an average population of c. 1000 winter residents, rising to 15,000–20,000 over the summer months, mostly comprising day-trippers but also including seasonal summer residents due its natural features, which include ocean cliff walks, beaches and bike trails (Dwyer, 2016; Dwyer & Bidwell, 2019). Rhode Island first began exploring the potential for offshore wind development in 2007, engaging a wide range of stakeholders including the civic actors like the Rhode Island Office of Energy Resources (OER), fisheries representative organisations trades and businesses groups. BIWF was approved through a long-term power purchase agreement (PPA) between the developer, Deepwater Wind (now Ørsted) and the National Grid, following legislation ratified in 2009 and 2010 allowing for PPAs to be issued for offshore wind projects (Leon, 2018).

An Ocean Special Area Management Plan (Ocean SAMP), developed by the Rhode Island Coastal Resource Management Council (CRMC) and University of Rhode Island (URI), was adopted in 2010. The Ocean SAMP, along with further research and stakeholder meetings, which took place between 2009 and 2011, provided some insight into the differing uses of the state waters and the potential for offshore wind projects in these areas. The BIWF location was selected following this research, along with other suitable sites for future offshore wind projects along the Rhode Island and Massachusetts' coasts (Leon, 2018). Initially conceived as part of a much larger 385MW project which would have occupied Massachusetts and US federal waters, the decision was made to go ahead with BIWF with the turbines located in Rhode Island waters, with some of the power supplying Block Island, the transmission cable also traverses federal waters. The supplying of power to Block island residents has proved popular given the high costs of electricity islanders experienced before the project, having largely relied on diesel-powered electricity generators at the time.

Project summary

BLOCK ISLAND WIND FARM
America's First Offshore Wind Farm

Company: Deepwater Wind, LLC (Ørsted US Offshore Wind)

Location: Rhode Island, USA

Construction: 2015–2016

Commissioned: 2016

Size: offshore five turbines, 30MW capacity

Distance from shore: 6.1 km

Annual net output: 125 GWh

Status: In operation

Capital cost: $290 million

Engagement strategy

Klain *et al.* (2017) attribute the success of the project to (i) the provision of custom-tailored community benefits and (ii) a planning process in which "bi-directional deliberative learning" was heavily ingrained, building what Dwyer and Bidwell (Dwyer & Bidwell, 2019) call a "chain of trust" with two distinct, but reciprocal public engagement processes being implemented: an initial state-led initiative known as the Ocean Special Area Management Plan (Ocean SAMP) and a second engagement process led by the private developer, Deepwater Wind (Dwyer, 2016).

Additional approaches deemed positive include:

- Early, informal and targeted engagement with process leaders identifying potential barriers to trust before legally mandated processes began
- Hiring of trusted community liaison officers
- Incorporating stakeholder input in the decision-making process
- A tailored community benefit programme that addressed the needs of the islander (*e.g.,* high-speed broadband).

(5) Energy Recovery Facility, Portsmouth, Hampshire UK

Overview

Landfill for waste management in Hampshire, UK, has always been a concern given the high permeability of the bedrock there and its vulnerability to groundwater contamination. Consequently, incineration has been central to the county's waste management strategy since the late 1960s. In 1992, planning permission was submitted for a 400,000 tonne per annum Waste to Energy (WtE) plant, to be positioned on the site of the old incinerator in Portsmouth. Public and political opposition mounted, and planning permission was ultimately refused. A review of opposition to the development found that although there was widespread support for WtE in principle, the visual impact of the infrastructure was deemed unacceptable. The recommendation made by the planning committee was for "a series of smaller incinerators combined with the maximum use of recycling", which the council ultimately agreed with. To ensure public support going forward, the municipal government needed to radically rethink their means of engaging with local community stakeholders. They decided to develop a waste management strategy, which would lay the groundwork for the next development by defining what community stakeholders were un/willing to accept.

The engagement process which resulted has been described by Bull *et al.* (2008) as being "highly innovative" and was based on deliberative ideals. With a view to consensus building and conflict resolution the 'deliberative engagement' was facilitated by means of three community advisory fora. These CAFs were described by Petts (1995, 1997) as being part of a "voluntary, proactive, public engagement programme". The aim of these fora was to seek a broad understanding of the public support for the strategy which would ultimately result in the development of new facilities for municipal waste treatment. There was one forum established for each of the County's regional groupings for waste management: North (around Basingstoke), Southeast (centred on Portsmouth) and Southwest (around Southampton). The deliberative engagement process was accompanied by more traditional standard forms of consultation.

Project summary

Company: Veolia UK

Facility: Integra South East ERF (one of three facilities in Hampshire)

Location: Portsmouth, Hampshire, UK adjacent to material recovery facility

Duration: 2005–present

Feed stock: non-recyclable household wase

Maximum throughput: 210,000 t per annum

Maximum generating capacity: 14 MW (enough for energy needs of 20,600 homes)

Status: In operation

Capital cost: undisclosed

Engagement strategy

Aimed at consensus building and conflict resolution through 'deliberative engagement' by means of three independently chaired community advisory fora, the objectives of which were:

- To provide a sounding-board for the development of an integrated waste management strategy.
- To identify issues and areas of concern about different waste management options and the most appropriate options for Hampshire.
- To provide feedback to the County and districts.
- To comment on the proposed range of options for communicating information to the general public.

As a result of the deliberative process and the consultation processes, an agreed waste strategy was developed and put out to tender.

(6) Barendrecht CCS Project, Netherlands

Overview

The Barendrecht project was an unsuccessful carbon capture and storage (CCS) demonstration project originally planned for development in the Dutch town of Barendrecht, in the west of the Netherlands. It is frequently cited as an example of how poor communications with stakeholders and an incoherent public engagement strategy contributed to growing public opposition to the project. At the time, Barendrecht had a population of approximately 44,000 people, many of which were young families (Brunsting, de Best-Waldhober, *et al.*, 2011). The town is situated close to the heavily industrialised Rijnmond district, home to a number of large oil refineries and chemical manufacturing plants. The Rijnmond industrial area contributes significantly to the Dutch economy with intensive manufacturing, storage and transport of chemicals and fuel products to much of central Europe. Consequently, the area is a significant contributor to the country's overall greenhouse gas emissions, and has been identified as a priority area of action in Dutch energy and climate policy (Feenstra *et al.*, 2010).

Shell Storage B.V., the project owner and developer, began preparations for the CCS demonstration project in 2006. They began communication with the municipal government in 2007 and then with the general public in early 2008. It quickly became apparent that local politicians were opposed to the project and local stakeholders, particularly residents, had health and safety concerns about onshore CCS storage. Through a series of missteps on the part of Shell, what began as local opposition and criticism of the project from NGOs and the local population transformed into formal opposition by the municipal government in 2008. The project suffered a number of setbacks, with an estimated delay of at least two years by the end of 2009. Relations between the main stakeholders became polarised, disabling effective dialogue, and the project was officially cancelled in 2010 with the new Dutch coalition government bowing to local opposition to the project (Ajuonuma, 2010; Brunsting, de Best-Waldhober, *et al.*, 2011).

Project summary

Company: Shell Storage B.V.

Location: Barendrecht, Netherlands

Duration: 2006¬2010

Size: demonstration project

CO_2 Source: Pernis Refinery Rotterdam harbour area

Capture technology: Refinery Pre combustion

Storage: 10 million tonnes capacity from two depleted gas fields close to Pernis Refinery

Status: cancelled

Capital cost: government subsidy €30m

Engagement strategy

A number of contributing factors have been highlighted as to why the project received such negative attention at the time. The approach to public engagement appears ad-hoc at best and poorly thought out. For example:

No local stakeholders were involved in the tender procedure, with no public consultation or investigation of local opinions to a CCS demonstration project.

There was almost no (informal) direct communication between the project developers and the local government, and the debate began to take place almost exclusively via formal procedures, organised events, press releases or the media. This closed down any opportunity for discussion between the protagonists.

This adversarial approach also, limited any opportunity for stakeholders to express a more nuanced perspective on the proposed project. One had to be either 'for or against' the project.

The actions of the national government (removing executive powers from the local government) further angered local opposition to the project.

(7) Tomakomai CCS Demonstration Project, Japan

Overview

The Tomakomai carbon capture and storage (CSS) project offers an interesting case study in how CSS-related projects can benefit from identifying and engaging with key local stakeholders as early as possible. Japan recognised early on the potential for deploying carbon capture and storage technologies. In 1993, Tanaka *et al.* (1995) conducted a nationwide study of CO_2 storage capacity of deep saline aquifers across Japan based on based on pre-existing oil and gas exploration data with storage capacity estimated by assuming all injected CO_2 would be dissolved in-situ. From this work, it became widely recognised that those areas posing the greatest potential were usually sited offshore and at considerable distances away from the locations where largescale CO_2 emissions were taking place. This source/sink mismatch was also seen a significant barrier to developing economic interest or investment in the technology (Nakanishi *et al.* 2009).

The initial estimate of 80 billion tonnes of CO_2 storage capacity nationally from Tanaka *et al.*'s (1995) study was revised over the intervening years to upwards of 146 billion tonnes in 2005 (Tsuzuku 2015). This was seen as a significantly positive development given Japan's increasing commitments to tackling anthropogenic climate change and the shift to a low carbon economic model, with all the decarbonisation efforts required to do so. Successfully implementing a credible public outreach programme for the project was considered a vital importance both to METI and JCSS. Consultations with key local stakeholders (including local government representatives, the Tomakomai Federation of Fisheries Cooperative Associations, local residents, and other business and citizens representative organisations) began at the preparatory stage of the project, before commencement of the first 3D survey in 2009.

Suzuki *et al.* (2018) outline in detail the approach taken by JCCS took with regards to public engagement. The company maintained a sustained open presence in the local community, beginning during the seismic-survey phase of the project, hiring a representative already well-known and respected in the area.

Project summary

Company: Japan CCS Co. Ltd and Ministry of Economy, Trade and Industry (METI)

Location: Tomakomai, Hokkaido, Japan

Duration: 2012¬present

Size: demonstration project

Annual net output: 0.1 t/yr

CO_2 Source: hydrogen production unit at nearby oil refinery

Capture technology: activated amine process

Storage: offshore geological storage

Status: in operation

Capital cost: not available

Engagement strategy

The approach taken to public engagement appears to be sustained and open, with stakeholders given the appropriate channels to communicate grievances and see actionable outcomes that tried to address their concerns.

Stakeholders were categorised into three geographic areas:

1. Tomakomai City and its environs;
2. national stakeholders across Japan;
3. international stakeholders potentially interested in the project.

This approach allowed JCCS tailor its engagement activities to specific target audiences.

Applied a culturally responsive attitude to local stakeholder concerns, being mindful of local sensitivities and the lived experiences of individual stakeholders.

Established very early on in the project a good working relationship with the local government, demonstrating good faith and supporting efforts beyond just the immediacies of the project.

5 Learning from the EPE case studies

5.1 Introduction

Each of the EPE case studies studied for this report were subject to a specific complex enmeshment of external and internal factors that ultimately contributed to their success or failure. Despite this, there are a number of commonalities to be found that either increased or decreased the likelihood of a positive or negative outcome in each case. These include, but are by no means exclusive to, factors such as the importance of developing local connections within the community where the project is located, the importance of early informed engagement and the value of 'delivering on your word'.

For example, a lack of effective communication and proper public engagement, especially with local stakeholders early on in the process, suggests process leaders may not always take into account the socio-political dimensions of a project with all the seriousness this deserves. The failed Barendrecht CCS project in the Netherlands for example, saw the company constantly having to defend its actions with local stakeholders. One informant made reference to the fact that the project developers, had not yet acquired the support from the local council (a key local stakeholder, and likely to be a potential thought leader) before hosting public meetings to raise awareness of the project. This put their communication strategy at a disadvantage since key stakeholders were unfamiliar with the details of the project and therefore weren't in a position to give their support. This oversight, compounded by other actions, resulted in the local community developing a deep distrust of the project early on. Referring to a significant wastewater infrastructure upgrade in a southern coastal area of Ireland, another informant offered a contrasting portrait of their public engagement activities. The decision was made very early on to be upfront with local people regarding potentially negative aspects of the project, particularly with respect to disruptions to daily routines resulting from associated roadworks *etc.* These inconveniences were openly acknowledged and communicated to local people – and in a way sold to the local residents as them taking a degree of ownership in the project and that their patience was to be their contribution to making their area a better place. This was done through the project's formal communication channels but also re-enforced through the informal networks and relationships it had established early on.

Barendrecht and the other case studies we highlight offer a number of important lessons for future CCS project developers, including how to approach communication with community stakeholders (Feenstra *et al.*, 2010). The informant counselled that any CCS project must begin by winning the support of the key stakeholders within the community, which gives the entire project more credibility. Otherwise, as the old political adage goes 'when you're explaining, you're losing' – the potential goodwill of those stakeholders to the project. This, as we mentioned earlier could include the shift the traditional Decide-Announce-Defend (DAD) model of engagement to what Halliday (1993) describes as a 'consult-consider-modify' approach. This new approach requires more democratic decision-making, rather than technocratic and corporatist-style deliberation, as well as open-mindedness that facilitation of multiple perspectives, rather than single, closed-ended projects (Wolsink, 2007).

Participation is becoming important not only for the implementation of certain projects, but also for improving the image of the industry and widening its public support (Aitken , 2016). Also, it should be noted that not all so-called participatory engagements are necessarily good. Just because a developer packages its public engagement activity in 'participatory' language or claims to adhere to notions of procedural justice *etc.* does not mean that they are actually building relationships with communities based on trust. Even when a developer attempts to engage with community stakeholders in good faith, different actors involved in the process – often informed by different understandings of what participation actually means – may use their (unevenly distributed) capacities to impose their understanding on the procedural processes taking place (Van Wymeersch , 2019).

5.2 Lessons learned

This subsection explores the key challenges of conducting EPE activities and using examples from the case studies presents instances of best practice and examples where approaches could have been modified for the better. They are presented here as a series of lessons learned, which process leaders are encouraged to consider when engaging in public engagement activities. They are by no means exhaustive, but they do cover the broad range of experiences associated with dealing with local stakeholders.

1. Early engagement is a key factor to consider

Early and open channels of communication with the public helps build mutual trust between process leaders and the community, reinforcing the notion that projects benefit when stakeholders across all groups are involved in the process. Ideally, the local community should be involved in the process of location selection, permitting, and policy-making, as soon as a project in proposed (Brunsting, de Best-Waldhober, , 2011). While this may not always be possible, an avenue should be opened as early as possible for interested stakeholders from the local community to take some degree of ownership in the project. This can be financial, but very often adopting a partnership approach to public engagement (where local concerns can be and are seen to be taken seriously) can foster significant goodwill. Early engagement also allows process leaders to explore the values, needs, and opinions of all stakeholders and integrating these insights into the project design allows for a more robust project framework overall, and opens space for adaptation if the need should arise (Feenstra , 2010).

In the case of the Barendrecht CCS demonstration project, the developers presented the project to the public almost as the finished plan, with no obvious avenue open for local stakeholders to give their perspectives or air their concerns and grievances. The developer's actions in many ways followed the Decide-Announce-Defend (DAD) approach to public engagement (Cascetta & Pagliara, 2013) and this made them a target for opposition from the very start. Had the public been better consulted earlier in the process, and more attention given to different perspectives, the potential for establishing a more trusting relationship between all stakeholders could have opened up space for the company to move away from the confrontational role it subsequently took on. However, early engagement can generate feelings of exclusion if there is not enough attention given to who the target audience should be. A number of seasonal residents from the Block Island Wind Farm project, for example, were not able to participate in the early meetings that took place over the winter months. While any offence was

unintentional on the part of the process leaders, the decision to begin community engagements during the winter months conveyed to some seasonal residents a certain unwillingness on the part of the process leaders to engage with the whole community (Dwyer & Bidwell, 2019). This example highlights the importance of timing to early engagement activities and how significant the first interactions between process leaders and stakeholders can be in forming stakeholder expectations of the process leaders and the project itself. However, this misstep did not escalate into more direct confrontation partly due the local stakeholders' experience of the state-level marine planning process that took place as part of the Ocean SAMP[20]. Long before public engagement began for the BIWF development, the Ocean SAMP process helped inform a significant cohort of key stakeholders on the island and made them feel that their concerns and local knowledges taken onboard. While the Block Island community is small and quite well-defined, which aided the public engagement process to some degree, their exposure to a largescale ocean-planning framework in which offshore wind was a factor (Klain *et al.*, 2017) helped establish residual goodwill within the Block Island community by the time the wind farm was being proposed (Dwyer & Bidwell, 2019).

2. The hiring of trusted liaisons is a successful method for gaining public support

This policy was successfully implemented in a number of the case study examples, including Block Island Wind Farm (BIWF). Liaison officers had extensive knowledge of both Block Island and its environs, and neighbouring areas on the mainland having lived or worked in these communities for considerable lengths of time beforehand. In the Block Island example, a relatively small community was being directly impacted by the project. Therefore, liaisons had an important role to play as trusted members in that community. If, however, we consider this approach in terms of scalability, would process leaders have a more difficult time finding individuals who are well-known and trusted in an area with a much larger population? Similarly, certain informal engagement methods, like door-to-door outreach or holding "science-fair" style events, can be more difficult in a larger community (Dwyer & Bidwell, 2019). However, this was not borne out in the Tomakomai CCS project where initial contact with the local community was carried out during the seismic survey work with a company representative who had already built-up considerable experience in oil and gas exploration in the Tomakomai area. Being a 'known entity' with at least some members in the local community was particularly useful for the company, JCCS, and it was at this early stage of the project that the developers began implementing a trust building process with local stakeholders the company identified as being key to the project.

This process was to be "*maintained by mutual respect and JCCS's deep consideration for the local stakeholders' daily lives*" (Suzuki *et al.* 2018, 5). It was this concerted effort on the part of the JCCS representative, who repeatedly made himself available to local stakeholders, regularly visiting them to address concerns they may have raised about the work being carried out *etc*. in conjunction with these activities, JCCS also engaged in a partnership-style approach with representatives from the local

[20] The Rhode Island Ocean Special Area Management Plan, or Ocean SAMP, is as a coastal management and regulatory tool primarily concerned with balancing marine development with the protection of Rhode Island's ocean-based resources.

government, fisheries cooperatives and local residents' groups to share information to the wider community in Tomakomai. An example of the type of engagement work JCCS carried at the time is relayed by Suzuki *et al.* (2018, p. 5), who describe an incident during the planning stage when a survey well sited was being drilled near a wildlife conservation area. On discovering drilling would coincide with the nesting season of an endangered bird species living nearby, the developers immediately changed the drilling schedule and altered the layout of the drilling site to minimise its impact on local wildlife. This incident was described as a "community-first" for the area and strengthened the relationships between METI, JCCS and the local government. Another example is the response JCCS made with regards to a complaint from a local resident who was concerned about increased traffic and noise pollution from works they were carrying out in the neighbourhood. The company introduced new protocols for operatives working in the area, including reducing the speed of company vehicles, *etc*.

3. Informal, direct communication is highly beneficial

Both formal and informal communication should take place between process leaders and the public, to regularly discuss changes to the project, the process and the procedures, as well as ensuring that all concerns and viewpoints from as broad a cohort of stakeholders as possible are addressed in some way. Any communication with the community should aim to address issues and concerns raised by the public (Feenstra *et al.*, 2010). In the Barendrecht CCS project, there was no informal, direct contact with stakeholders outside of the formal process. This established a barrier to identifying potential conflict points early on and prevented potential solutions from being negotiated and agreed upon. While the informal aspects of the BIWF project proved to be an effective means of developing trust according to participants there, creating a sense of meaningful engagement with process leaders that ensured the participants felt heard and that they had an impact on the decision-making process. The blended (informal and formal) approach taken as part of this development was effective in gaining public support for the BIWF through fostering what Dwyer and Bidwell (2019) describe as a "chain of trust" between the process leaders and local stakeholders. The highlighted case studies which demonstrated the highest success rates of public engagement (including BIWF, San Cristóbal, Otway and Tomakomai) all had informal communication channels that could feed into the development process, usually through the project liaisons who were situated directly in the communities they were tasked with engaging.

4. Project developers should focus on building trusting relationships with the public

The process leaders must (at least at some level) be trusted by the community they are working with. Otherwise, any messaging they wish to convey may be open to hostile interpretation by those receiving it. Efforts should therefore be made to establish relationships whereby the process leader demonstrates they are responsive to the concerns of local stakeholders from the very start of a project. They must also proactively work to ensure they maintain a positive image in the eyes of the public (Feenstra *et al.*, 2010). This involves admitting when mistakes are made and offering solutions in a collaborative way to address those mistakes. Consequently,

> *trust is built in a project-stakeholder relationship by improving communication skills, behaving reliably, showing commitment, being sincere, benevolent and competent,*

> *obtaining and acting with integrity, working towards reaching project milestones and establishing common goals*
>
> (Karlsen *et al.*, 2008)

In the Barendrecht case study, there appears to have been very little substantive effort made in establishing a good working relationship between the process leaders and the public. This resulted in any action taken by the developers being interpreted as potentially hostile by stakeholders in the local community who were by then suspicious that any action by the process leader may have had another motive attached to it. The "bad first impression" the developers made with local stakeholders, once done, was very hard to change even when they attempted to improve their communication strategy with the public. When an information centre, ordered by the Ministry of Housing, Spatial Planning and Environment, was established in Barendrecht, its aim was to provide neutral information to the public. However, employees working in the information centre at the time affirmed that many visitors to the centre wrongly assumed the centre was a marketing tool to promote the interests of the project developers. Staff were also accused of being paid by the process leader to try to influence visitors' in favour of the project (Feenstra *et al.*, 2010).

The Block Island Wind Farm (BIWF) case study, in the other hand, demonstrates where the focus was very much placed on meeting stakeholder expectations in order to build trust. Rather than assuming a more traditional DAD approach to public engagement would be enough to build trust, the process leaders realised they needed to be more active with their interactions with the public. This can be painstaking work. However, the likelihood of a successful outcome is far greater as a result of such actions, though of course not guaranteed (Dwyer & Bidwell, 2019). Again, the state-level marine planning process which took place as part of the Ocean SAMP, before any public engagement began for the BIWF development, most likely contributed to encouraging community engagement with the BIWF when it was proposed. At this stage, the Block Island community had already been exposed to a larger ocean-planning framework in which the issues around offshore wind were discussed (Klain *et al.*, 2017). When the engagement process for the BIWF development finally began, a chain of trust model was applied to the community engagement activities which helped build support (or at the very least, a neutral perspective) within the Block Island community. These early trust building efforts aimed at establishing stakeholder expectations of the process leaders, the process and the eventual outcome, played a key role in the project's success (Dwyer & Bidwell, 2019).

5. Information supplied to the public should be of high quality and tailored to their culture and context

The Tomakomai CCS project highlights the importance both the availability of information and its quality is to efforts in establishing trust. The culturally responsive approach[21] taken by METI and JCCS was further complimented by a sustained educational outreach programme that outlined the wider

[21] The term cultural responsiveness is more often found in literature engaging with the education, the built environment, health, legal and human services sectors (Rapoport, 1987; Sasakamoose *et al.*, 2017; Sue *et al.*, 1991; e.g. see Vincent *et al.*, 2011). However, it is also informing changing attitudes around business process management and international project management (e.g. see Lückmann & Färber, 2016; Schmiedel *et al.*, 2015).

contexts informing CCS development (anthropogenic climate change), accessible literature outlining the how CCS works in principle, and that demonstrated recent working examples of both its efficacy and its safety. These panel exhibitions also had a hands-on-dimension to them with those in attendance able handle rock samples of the types involved in the project. They also allowed an opportunity for expressions of concern by the residents to be shared with the developers, which they took onboard developing a programme of common objectives to build trust with local residents, especially around the themes of safety and security (Suzuki *et al.*, 2018). This involved categorising stakeholders into three distinct geographical areas and tailoring responses to meet the varied, and often individual, needs and concerns expressed to them. These operational areas comprised Tomakomai City and its environs, national stakeholders across Japan, and international stakeholders potentially interested in the project. Suzuki *et al*. (2018) outline this approach in Table 1 and Table 2 below.

Table 1 Categorisation of stakeholders by geographic area and activities to be emphasised (Suzuki *et al.*, 2018)

Area	Tomakomai City	Japan (nationally)	International
Core principle	Be creative in building trust with individual audiences		
General information	Knowledge and information on current CCS technology and Tomakomai CCS Demonstration Project		
Major emphasis	Safety and security of the project Detailed explanation of the project and activities	Safety Viability of CCS technology Future outlook	Main features of the project Extensive monitoring system to remove concerns about earthquakes
Specific implementation guidelines	Create opportunities to engage with individual stakeholders Respect local stakeholders' livelihoods Keep local stakeholders engaged with the process Full consultation and consent of the local government and relevant parties Avoid costly performance or advertising activities Prioritise listening	Effective information delivery to the wider community of stakeholders Information exchange	Information exchange Support METI to explore possibilities for collaboration, including the Global CCS Institute and the Carbon Sequestration Leadership Forum (CSLF)

Table 2 Public outreach activities in Tomakomai City, based on stakeholder cohort (Suzuki *et al.*, 2018)

Stakeholders	Activities
Key stakeholders	
Municipal government	Information sharing and consulting
Fishery cooperatives	Information sharing
CCS Promotion Association Industrial organisations and academics	General assemblies, site tours *etc.*
Citizens of Tomakomai city (all generations)	Panel exhibitions Site tours CCS forums Open, accessible data on JCCS website
Younger generations	*Educational programmes* • One-day summer school • Science class for school children • University lectures
Senior citizens	CCS courses and lectures at college for senior citizens Site tours

The company put considerable effort into the panel exhibitions, hosting them at various sites around the city that they identified has having significant footfall including the City Hall, local community centres, libraries, schools, shopping centres, and transport hubs like train stations and the airport. Some thought was put into the communication activities and there was fine-tuning depending on who the target audience was at the time. For example, when giving a presentation to children at after-school centres in the city, they showed age-appropriate information cartoons, carried out demonstrations using baking soda and lemon juice to produce CO_2 to fill balloons and distributed cartoon comics for the children to take home with them (Suzuki *et al.*, 2018). When engaging with senior citizens the approach changed to lectures and site tours with concerns regarding the safety of the technology addressed by openly disclosing information. For example, the company installed an electronic bulletin board at City Hall which displayed daily CO_2 injection volumes, borehole pressure & temperatures, in addition to regular CO_2 concentration readings for the surrounding seawater and seismic activity data.

With regards to the Barendrecht CCS project, Brunsting *et al.* (2011) concluded that while a lot of detailed information was supplied to the public in this instance, it was not presented in language that was either accessible or easy to understand for members of the public not directly experienced in CSS or the technologies involved. Upham and Roberts (2011) explain that people not only have a low level of understanding about CCS, but also they have little knowledge of the nature of CO_2. This meant that trust was difficult to establish, even with those who may have been inclined to have a largely positive view or neutral opinion on the project. The information supplied simply did not meet their needs to establish an informed opinion on the subject. Furthermore, the community had to rely on the information supplied by the project developers, who were already deemed untrustworthy by some, since more independent and accessible information on CCS and its wider context were not available at the time. This meant that much of the information being supplied to the public had not been endorsed

by multiple stakeholders and was therefore deemed to have either a positive or negative bias. Sources of information which were tailored to the public and took a more neutral stance on the matter, such as the information centre, were launched too late into the project process for it to have a significant effect on communication between the various stakeholders (Brunsting, de Best-Waldhober, *et al.*, 2011). Therefore, one key challenge for a project developer is to communicate and engage with the public in a manner that engenders the credibility of both the project itself and the developer (Ashworth *et al.*, 2012). Furthermore, communication about the project requires a constant attention and tailoring strategies that adapt the information the specific cultural and other contextual requirements of the project (Hund *et al.*, 2004).

6. CCS should be framed within a larger climate change mitigation context

The CCS project itself should be discussed along with any available alternative energy technologies, and the larger socio-environmental context to CCS should be made known. Concerns have been raised that CCS is not sustainable, does not tackle the root of the problem and can be viewed as simply "sweeping the issue under the rug" all the while reducing investments in renewable energy technologies (L'Orange Seigo *et al.*, 2014). Framing CCS as a bridging technology that will not discourage investments in renewable technologies can address these concerns and can have a positive effect on people's attitude towards the technology. Demonstrating existing successful CCS projects and describing how a proposed project will contribute to wider efforts to mitigate climate change offers a more positive and constructive way to engage with local stakeholders (Feenstra *et al.*, 2010). Generally, people who are concerned about climate change and want to do something about the issue would prefer to see solutions such as wind farms and solar panels being proposed, rather than a project associated with CO_2 which carries negative connotations for most (Kuijper, 2011).

Since CCS is a technology that is relatively unfamiliar to the public, perceptions of CCS are influenced by the framing provided by researchers and developers (Whitmarsh *et al.*, 2011). It is important therefore that CCS is discussed in the context of alternative solutions to the problem of climate change, ideally before any specific CCS demonstration project is proposed or started. At the time the Barendrecht project was proposed Kuijper (2011) suggests a significant cohort of the population in The Netherlands was inclined to consider the climate crisis as being exaggerated compared to elsewhere in Europe. Unfortunately for the project in Barendrecht, the proposal was not preceded by an organised discussion on the relative strengths and weaknesses of CCS in contributing to talking the climate crisis (Brunsting, de Best-Waldhober, *et al.*, 2011). The public are less likely to accept a project if they do not fully understand the importance of why it must take place, or why it should be located in say an urbanised area, as opposed to a more remote location. This lack of meaningful discussion within the lager climate change context can contribute to growing opposition to CCS or any other large infrastructural project.

Another case study, Jänschwalde CCS, highlights how this approach can sometimes backfire. The Jänschwalde CCS project was framed by the process leaders as making a positive contribution to the climate crisis. However, opposition groups in Germany were not convinced by this narrative and saw

carbon capture technology as a means for greenwashing[22] the fossil fuel industry. The process leaders for the project could not successfully refute this with plausible counterarguments and therefore were unable to secure the goodwill needed to deliver the project.

7. All discussions should be respectful, especially when opposition arises

The Barendrecht project highlighted how opposing sides of an argument can be disrespectful of the other's perspective, thus resulting in pointless discussion leading to deadlock. Proponents of the CCS demonstration project considered questions regarding the necessity of CCS and available alternatives to be irrelevant, and sometimes deemed concerns about safety to be emotional or irrational (Brunsting, de Best-Waldhober, *et al.*, 2011). This almost casual invalidation of the other side's concerns, rather than taking a more constructive approach to addressing those concerns, undermined the potential for establishing trust and developing positive relationships between all stakeholder groups. Therefore, it has proved important to take concerns of the population seriously and take perceptions during the communication processes into account (Fischedick *et al.*, 2009).

8. The main stakeholders should be able to contribute to the decision-making process

In the Barendrecht case, dialogue between the stakeholders should have included a wider variety of perspectives to the project, with stakeholders assigned greater agency in the decision-making process. However, this was not the case as local parties never really possessed any formal channels to influence the project outcome. As a result, the public sought out different means of having their voices heard, through organising public protests and voicing their concerns and opinions through the media, contributing to greater polarisation between the developer and stakeholders (Brunsting, de Best-Waldhober, *et al.*, 2011). Stakeholder engagement and participation in decisions large energy infrastructure projects such as CCS helps decision-makers to understand, identify and address public interest concerns, thus taking environmental and social considerations into account as part of the decision-making process (Richardson & Razzaque, 2005).

9. Process leaders must remain honest about their motives

The Barendrecht project resulted in stakeholders openly questioning the integrity of the other parties, mainly as a result of claims made by project proponents which came across a little too strong. For instance, during the first public information meetings, the developers frequently stated that the "demonstration project" completely safe in technological terms, and that lessons to be learned where only to be found in areas such as legal procedures and monitoring. Nonetheless, the Environmental Impact Assessment (EIA) report admitted that the project would also provide technical lessons as uncertainties still exist with the technology. By declaring that the technology was completely safe, the project developers unnerved many community members and made it seem like they were just trying to push the project forward. A more effective public communication strategy would have been to admit

[22] Coined by the American environmentalist Jay Westerveld in the mid 1980s, the term greenwashing describes the increasingly sophisticated process whereby companies engaged in environmentally unsustainable practices deflect attention away from those practices by presenting themselves through advertisement campaigns as being somehow pro-environmental.

that uncertainties still existed with the technology. Furthermore, the developer also made a claim that the company would not make money from the project, a statement about which many of the public were sceptical. Instead of admitting this, the project developers consistently argued that climate mitigation was the main reason for the project, all the while refuting alternative options for climate mitigation measures (Brunsting, de Best-Waldhober, *et al.*, 2011). Claims such as this did not help build trusting relationships between the public and the process leaders, and likely contributed to increased opposition to the project.

10. Just because an area has past experience of energy-related infrastructure does not mean acceptance of CCS is a given

Local acceptance has been higher in areas with a history of extractive and fossil fuel industry due to the possibility of creating job opportunities and other incomes related to CCS activities (Haug & Stigson, 2016). Nonetheless, past industrial experience does not guarantee acceptance of CCS. The people of the Barendrecht had experience with industrial activity in their locality, which helped in communicating the relative impacts of CCS. However, although Barendrecht had a history of recent infrastructure projects of regional or national importance, many locals felt that when it came to the proposed CCS demonstration project, the town had "done enough for projects of national importance" and shouldn't have to endure yet another activity offering few, if any, local benefits (Kuijper, 2011). Another CCS project at the time that received a similar fate was Vattenfall's proposed €1.5 billion CCS project at Jänschwalde in east Germany. This region of Germany already had significant energy infrastructure in place, most notably a 3,000 MW lignite-fired power station with all the environmental issues associated with it. Despite what should have been a relatively positive message associated with the proposal, with a projected carbon capture of some 1.7 million metric tonnes per year, opposition at the local and federal levels resulted in the project being abandoned. Despite initial prospects for CCS in Germany appearing quite favourable, with political parties and industry largely supportive. In addition, many environmental NGOs at the time appeared to be at least moderately in favour, adopting a cautious approach can calling for further research while still preferencing renewable energy technologies. However, a 2009 ruling by the EU, known as the "CCS Directive" requiring member states to establish national legislation for CCS, had a strong knock-on effect to CCS perceptions within Germany. The CCS Directive allowed member states to set significant limitations on the deployment of CCS technology, which led to the legislation (known as the CCS Act) to be presented to parliament numerous times, from 2009 to 2012. This series of events resulted in the act being passed in 2012, establishing highly restrictive clauses limiting the deployment of CCS in Germany and representing a victory for opponents of CCS at the time which included Greenpeace, BUND, *etc.* (Lockwood, 2017).

6 Conclusions

In this report a number of examples of Education and Public Engagement from around the world were identified through a literature search combined with recommendations from the consortium members and their networks. The case studies were characterised through a desk study supplemented and complemented by interviews with key informants using video chat technology. The methods used for

EPE in each of the cases was identified, key challenges faced by such programmes identified. Finally, examples of best practice from the case studies were identified. As discussed in the previous chapter, based on the lessons learned from the case studies, and EPE experiences reported in the literature a number of recommendations for CCS developers have been forwarded, these include:

1. Engage with communities early to open channels of communication and build trust.
2. Hire liaison staff who either already have good relations with local communities, or who have the skills to develop trusting relationships with communities.
3. Complement official formal communication with informal, indirect communications to ensure effective outreach and build a 'chain of trust' with communities.
4. Build trust through early, open and responsive communication with communities.
5. Supply the public with high quality information, tailored to their specificities.
6. Frame CCS within a larger climate change mitigation context.
7. Ensure discussions remain respectful, especially when opposition arises.
8. Enable social stakeholders to contribute (in a meaningful manner) to decision-making process.
9. Be be open and honest about motivations for CCS project.
10. Don't reply on previous experience of communities; remember *past performance is no guarantee of future results*!

This critical review of EPE deliverable was prepared as a preparatory document for WP4. The knowledge developed in this task and presented in this report will now be used to develop an appropriate Educational and Public Engagement programme within Task 4.2.

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Appendix I – Interview schedule

Interview Schedule

General points

All interviews should be recorded, where interviewee gives permission, and detailed notes taken.

You should allow up to one hour for each interview

In all cases you are looking for the respondent's experience, perspectives and personal opinions – it is not a test of knowledge, there are no right or wrong answers!

Questions to be asked are listed in the left column and you can use prompts or supplementary questions from the right column. Try and ensure that you cover the topics listed in the right column

These are unstructured interviews; you can adapt the questions to suit the conversation flow, but ensure that you cover the topics as listed in the left column

The interview schedule is a designed as a guide for conversation, not a questionnaire. The interviewer should make sure they elicit a response to all questions below. However, an effort should be made to maintain the natural flow of the conversation.

Allow the interviewee scope to expand upon topics that are of interest to them, while possibly spending less time on others. You may also find that in answering one question, the interviewee will also give a response to another which you have not yet asked. In this case, there is no need to formally address this topic again.

Questions

Question	*Prompts*
1. Can you tell me about the project?	What was proposed? Who was involved? What was your relationship to the project?
2. What kind of relationship did the company have with the local community before the project?	To what extent were local stakeholders aware of the company before it started engaging with them?
3. Were there personnel working for the company from the local community?	Were they recruited before or after the project activities started?
4. What do you think were the key local attitudes towards the company / technology / industry?	Did local stakeholders air opinions on the project and what were they?
5. How did the company attempt to build up a rapport with members of the community?	What did they do? Did they engage local liaisons? Where did they succeed? Where did they fail?
6. What types of community outreach and engagement did the developers carry out?	Was there informal contact? How was the outreach received? Did different groups respond differently? What was the communications like at different stages of the project? What elements worked? How could they have been more successful?

Question	*Prompts*
7. What were the key issues, or concerns, for local people relating to the project?	Why do you think these were significant issues? Was there much opposition? Were there any expected issues or concerns that did not emerge?
8. How did the company respond to those concerns raised by the local community?	How successful was the company's response? Is there anything that worked particularly well? What could have been done better?
9. How did the engagement adapt to changes in community dynamics?	For instance, as opposition arose …
10. From your wider experience, what examples of good practice in public engagement particularly stand out?	Allow respondents to elaborate as much as they wish
11. Similarly, are there any examples of poor practice in public engagement that are especially memorable?	There's no need of course to say where it occurred!