Challenges for social impact assessment in coastal regions: A case study of the Tomakomai CCS Demonstration Project

Journal Item

Link(s) to article on publisher's website:
http://dx.doi.org/doi:10.1016/j.marpol.2017.06.015

Challenges for social impact assessment in coastal regions: a case study of the Tomakomai CCS Demonstration Project

Leslie Mabon1*, Jun Kita2 and Ziqiu Xue3

1. School of Applied Social Studies, Robert Gordon University, Aberdeen AB10 7QG Scotland, UK E: l.j.mabon@rgu.ac.uk; T: 0044 7864 006 762 (*corresponding author)

2. Applied Biology Group, Marine Ecology Research Institute, 4-7-17 Arahama, Kashiwazaki, Niigata, 945-0322 Japan E: kita@kaiseiken.or.jp

3. CO2 Storage Research Group, Research Institute of Innovative Technology for the Earth, 9-2 Kizugawadai, Kizugawa, Kyoto 619-0292 Japan E: xue@rite.or.jp

Abstract

This paper assesses challenges for social impact assessment (SIA) for coastal and offshore infrastructure projects, using the case study of the Tomakomai Carbon Capture and Storage (CCS) Demonstration Project in Hokkaido, Japan. Interest in SIA and linked concepts such as social licence to operate is growing, yet marine environments also have potential to raise additional complexity in project governance. Drawing on qualitative research conducted in Tomakomai and Japan more widely across the project development and implementation phase, the paper argues that building an understanding of the social, cultural and historical relationship between the community, industry and the sea is crucial to understanding the neutral or cautiously supportive response of the citizens and stakeholders in Tomakomai to the project. Moreover, effective SIA in coastal regions needs to find a way to account for - or at least make visible - these complex relations between society and the sea. Based on the findings, it is suggested that developers or policymakers overseeing SIA in coastal regions ought to pay extra attention to the extent to which developments like CCS are viewed by communities as 'new' as opposed to a continuation of existing activities in the sea; to the importance of engagement on monitoring during the project operations phase; and to the non-economic values such as pride and identity which communities and stakeholders may derive from the sea.

Keywords

carbon dioxide capture and storage; coastal communities; social impact assessment; social licence to operate; Tomakomai CCS Demonstration Project.

Highlights

- Evaluate social dimensions of Japan's first large-scale CCS demonstration;
- Refine extant social impact assessment principles with specific coastal focus;
- Cultural and historical relationship with sea key to understanding community

response;

- Coastal SIA needs to specifically accommodate community relations to sea;
- Complexity in marine environments makes careful in-depth SIA even more important.

1. Introduction

Interest is growing in social impact assessment (SIA), defined by the International Association for Impact Assessment (IAIA) (2003: 6) as "the process of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by these interventions." The potential for infrastructure projects to have effects in nearby communities has long been understood, yet proliferation of concepts like SIA and 'social licence to operate' – that is, an informal agreement based on ongoing approval and broad acceptance of society towards an operator conducting their activities in the local area (Prno and Slocombe, 2012; Rooney et al, 2014) – is comparatively more recent. These ways of thinking seek to more formally understand best practice in assessing the social dynamics of new developments from the pre-project stage across the entire project life cycle, in a similar manner to environmental impact assessments (EIAs).

In principle, it is argued that both EIA and SIA ought to be considered early on in the development process to reduce the probability of negative environmental and social effects arising from new developments (Barrow, 1997). Nonetheless, EIA and SIA have to an extent developed as separate entities (Slootweg et al, 2001), with legislative and conceptual differences between the two. On one hand, the undertaking of an EIA has become a legislative requirement for proposed new developments in many jurisdictions (Cashmore, 2004). SIA, by contrast, has evolved from a process originally undertaken as a component part of an EIA to meet regulatory demands, towards a much wider-reaching set of actions aimed at giving communities the ability to consent to developments prior to project commencement independent of environmental impacts (Esteves et al, 2012). Vanclay (2012) adds that whilst environmental impacts begin when project construction commences, social impacts may commence as soon as there is a rumour something may change. There is increasing attention to the interface between EIA and SIA, Slootweg et al (2001) holding that full understanding of the ‘impacts’ of a development necessitates holistic understanding of environmental and social effects. Reflecting the notion that the scientific basis of an EIA may itself be socially and politically informed (Cashmore, 2004), O'Faircheallaigh (2010) sees greater social participation in EIAs as a means of connecting environmental and social impact assessments. However, O'Faircheallaigh also sees the need for greater clarity around the extent to which societal involvement can influence the outcome of impact assessment decisions. In short, effective SIA necessitates understanding not only of how a development may change a community economically and socially, but also of how EIAs and evaluations of environmental effects arising from proposed developments are perceived by communities and to what effect.

Carbon dioxide capture and storage (CCS) is one such infrastructure technology where developers, policymakers and academics are moving towards means of systematically evaluating the social dynamics of proposed projects, with particular interest in how assessment of potential environmental effects are understood by society (e.g. Dowd and James, 2014; Kaiser et al, 2015; Hall et al, 2015). CCS involves three broad stages. The first is separating and capturing carbon dioxide (CO_2) emissions from coal- or gas-fired power stations or CO_2-emitting industrial sources such as steel, cement or chemical works. The second is transporting the captured CO_2 emissions, usually by pipeline or ship. The third is storage, whereby the CO_2 is injected into geological structures deep underground (for instance, depleted hydrocarbon reservoirs or saline aquifers) where it remains securely stored. These storage sites may be either onshore, or offshore under the seabed. At the storage stage, captured CO_2 may simultaneously be used to extract remaining oil from depleted reservoirs through processes of enhanced oil recovery (EOR). The aim of undertaking CCS is to reduce the amount of CO_2 entering the atmosphere from existing and ongoing electricity generation and industrial activity, hence reducing the likelihood of dangerous climate change (IEAGHG, 2017). Proponents of CCS argue it is a necessary technology to meet climate change mitigation targets due to the continued role of fossil fuels in electricity production; the difficulty at present of finding other ways to reduce CO_2 emissions from industrial processes; and the possible need for 'negative emissions' technologies in the future which depend on CCS-related transportation and storage processes (Global CCS Institute, 2016).

CCS is at the demonstration and early deployment stage globally, and social aspects identified for CCS-related projects which have come to fruition include perceived employment or economic benefit through continuation of regional subsurface operations (e.g. Boyd (2015) on the Weyburn project in Canada), community concerns over uncertainty and long-term effects (Mabon et al (2015) on the QICS experimental release in west Scotland) and also wider issues around fairness and transparency in decision-making processes (e.g. Anderson et al (2012) on the Otway Project in Australia). Injection of CO_2 into offshore geological structures has been argued to remove some of the most pressing social issues such as perceived risk and effects on house prices (Scott et al, 2014). Yet offshore CCS may also give rise to new social issues relating to legislation and governance challenges given the complexity of marine planning (Milligan, 2014), or to increased concern over pipelines given the need for more extensive transportation networks to carry CO_2 from onshore capture points to offshore storage sites (Ashworth et al, 2015). This interest in the social and political dimensions of offshore CO_2 storage is important given the increasing interest in offshore storage sites for reasons of geological suitability and/or socio-political factors in areas like China (Partain and Faure, 2016), Brazil (Roman, 2011) and Norway plus the wider Nordic region (Haug and Stigson, 2017).

This paper takes as its focus the Tomakomai CCS Demonstration Project in Hokkaido, northern Japan, which injects CO_2 into the seabed off Tomakomai City. Despite recent negative experience in Japan of the relationship between energy infrastructure, seismic activity and the sea; the large urban centre in Tomakomai; and the cultural and political significance of fisheries to the area, the Tomakomai CCS Demonstration Project appears to be proceeding through the execution stage without significant social issues arising. Given this challenging socio-political context, the purpose of this paper is therefore to (a) understand why the Tomakomai project has managed to reach the execution stage, and how potential challenges were surmounted along the way; and (b) use these findings to refine and develop existing SIA thinking with a specific focus on challenges for coastal regions. To do so, social science data collected in Tomakomai and beyond over the course of the project development and commencement phase is assessed.

2. Scholarly and policy context: governing new technologies in marine environments

Beyond CCS, marine and coastal environments offer significant opportunity in resolving resource and climate challenges. At the same time, however, in the contexts of the developing of new shipping routes (Dawson et al, 2014); deep-sea mining (Roche and Bice, 2013) and offshore renewable energy (Wiersma and Devine-Wright, 2014) there is recognition that processes taking place out at sea are not immune to societal issues. Challenges raised in this regard include not only the possibility for new offshore developments to negatively affect other marine economic activities such as fishing or shipping, but also the potential that changes to the sea could affect culturally significant landscapes and/or raise ethical and moral concerns over who has the right to make decisions about the future trajectory of such landscapes (e.g. Haggett, 2008). The Brent Spar controversy (Side, 1997) also demonstrates how opinion shapers such as environmental NGOs can be concerned about - and draw wider societal attention towards - actions taking place far away from land.

Vanclay (2012) suggests assessment of social impact in coastal management should not require significantly different processes to existing well-developed land-based impact assessments. It is worth noting, however, that marine and coastal environments do introduce some additional complexity. Emerging marine resource management processes which require mapping and formal division of the sea, such as marine spatial planning, can run up against more traditional ideas of 'ownership' or stewardship of the sea held by communities (Smith and Brennan, 2012). This in turn can lead to suspicion of or hostility towards management decisions imposed from on high by 'outsiders' perceived as lacking full understanding of the interplay between society and the sea (McKechnie, 1996). In any case, the flows of water across boundaries means marine governance requires engagement of a much wider range of actors and extends the distance across which risk communication may need to take place (Mabon and Kawabe, 2017). Moreover, questions around long-term liability, transboundary issues, and ongoing scientific research into ecosystem effects (e.g. Grehan et al, 2009; Jabour, 2010; Proelss and Gussow, 2011) across a suite of new ocean technologies indicate rigorous SIA procedures are particularly important in a marine context

Existing governance and decision-making processes for offshore developments may hence require further refinement to address the breadth and complexity of societal concerns engendered by marine environments. This paper thus takes Vanclay's (2012) principles for social impact assessment (SIA) in coastal management, and uses the case study of the Tomakomai CCS Demonstration project to draw out more specific challenges for undertaking SIA for offshore or coastal projects. The aim is not to provide solutions for offshore and coastal SIA. Rather this article uses a case study where there is high potential for controversy - as is now explained - to draw attention to challenges to which project operators, municipal governments and national-level regulators and policymakers ought to pay cognisance when assessing the social impacts of a new development in a coastal region.

3. Case study: the Tomakomai CCS Demonstration Project

Tomakomai City (population approximately 175,000 (Tomakomai City, 2016)) is located in the south of Hokkaido, the northernmost island of Japan (see Figure 1). As a port city, Tomakomai's economy is heavily reliant on carbon-intensive industries. It is home to one of the largest oil refineries in Japan, an oil storage depot, a coal-fired power station, and a sea-freight port as well as a major paper factory. The region surrounding Tomakomai also hosts steelworks in Muroran, and a declining coal industry with coal-bed methane potential in Yubari. Moreover, Tomakomai also has extensive coastal fisheries, with a particular focus on Sakhalin Surf Clams.

Figure 1: Location of Tomakomai City within Hokkaido (Adapted from map tiles by Stamen Design, under CC BY 3.0. Data by CartoDB and OpenStreetMap, under ODbL).

Tomakomai was selected to host Japan's first CCS demonstration due to its geological suitability and early completion of site characterisation (Abe et al, 2013). CO_2 is captured from hydrogen produced by a facility within the grounds of an oil refinery to the east of the city, and injected into permanent storage under the bay off the coast via wells drilled from the onshore injection facility site and running under the seabed. This storage consists of two reservoirs – one in the Takinoue Formation (approximately 2,400m to 3,000m below the seabed, storage point about 4km offshore), and the other in the Moebetsu Formation (approximately 1,100m to 1,200m below the seabed, storage point about 3km offshore) (Tanaka et al, 2014) (see Figure 2). Construction of the project commenced in 2012, and injection began in spring 2016. The project is expected to continue operating until 2020

(Japan CCS Company, 2017). In addition to monitoring marine species and seawater to ensure sequestered CO_2 does not enter the sea water, continuous observation monitors injection and seismic activity on the sea floor (Tanaka et al, 2014). CCS is significant for Japan beyond Tomakomai as the country is currently aiming to identify future offshore storage sites with a view to the practical use of CCS in future. This is seen as contributing to Japan's intended nationally determined contribution (INDC) under the Paris Agreement of a 26% reduction in greenhouse gas emissions by 2030 compared to 2013 (Okajima, 2016).

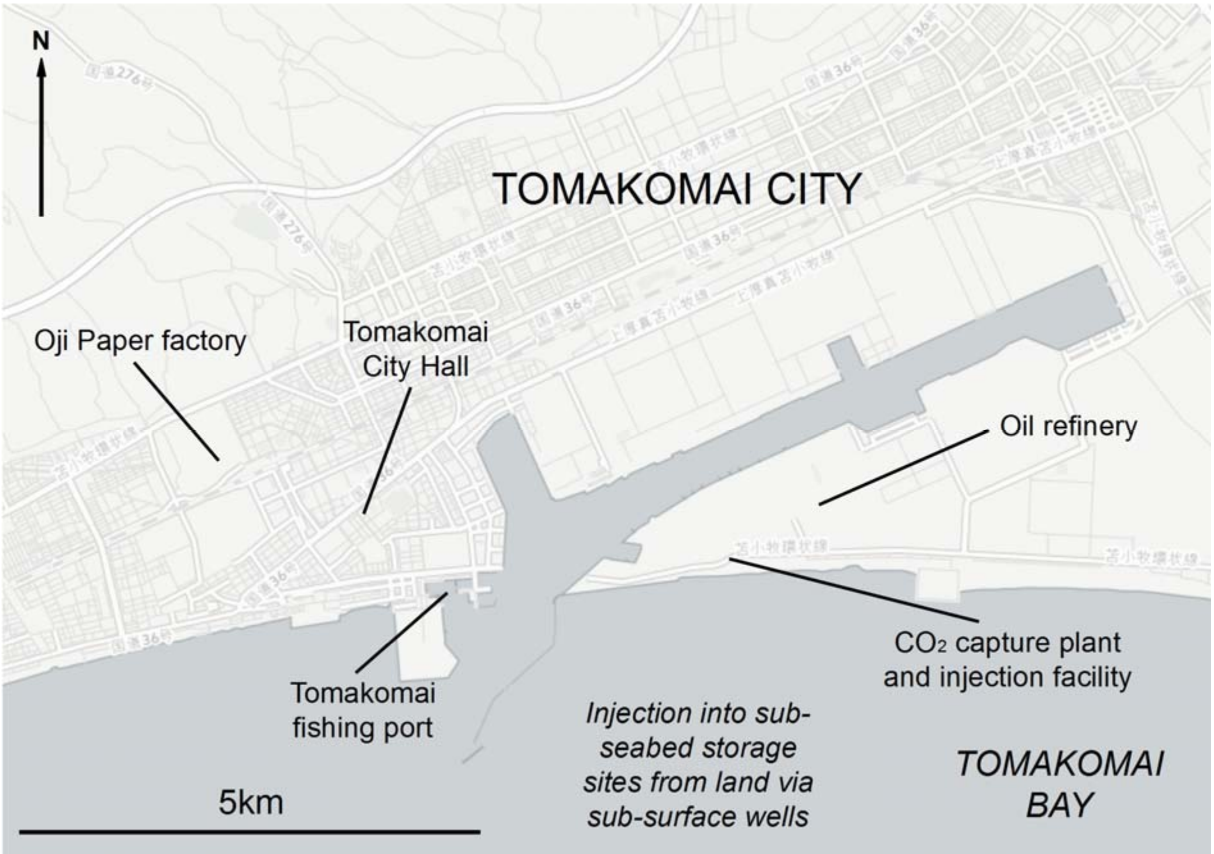

Figure 2: Location of CCS Demonstration Project within Tomakomai City (Adapted from map tiles by Stamen Design, under CC BY 3.0. Data by CartoDB and OpenStreetMap, under ODbL).

What is distinct about the Tomakomai project is that it is the one of the first CCS projects globally to take place close to a large centre of population. The population of Tomakomai – approximately 175,000 (Tomakomai City, 2016) – is significantly higher than existing 'host communities' for CO_2 storage, such as Estevan adjacent to the Canadian Boundary Dam project (population approximately 12,000) and Ketzin which hosted the German CO_2Sink demonstration (population approximately 6,000). CO_2 is injected into the geological structures beneath Tomakomai Bay, relatively close to the city and also to fishing grounds. It is therefore a useful case study to assess how stakeholders and citizens weigh up the risks and benefits of a new low-carbon energy technology taking place in the local environment, and to evaluate the role of both physical and social sciences in identifying viable and acceptable pathways to low-carbon futures for coastal city regions.

4. Method

It is important to be clear that the data on which this paper is based was not collected as part of a formal SIA process, rather through academic research undertaken by the lead author. Nonetheless, the data collection and analysis techniques used are similar to those discussed in much of the SIA literature (e.g. IAIA, 2015), with a qualitative methodology being adopted in order to develop in-depth understanding of the social and cultural factors which may drive community response to the CCS project and also inform social impacts. In particular, data was collected through the following means.

4.1. In-depth interviews

Semi-structured in-depth interviews were undertaken in Tomakomai, analogous communities in southern Hokkaido, and elsewhere in Japan (in order to access relevant expertise) between June 2014 and June 2016. This covered the phase from project development through to the commencement of injection. Based on existing knowledge of community dynamics in Tomakomai gained by the research team through physical science monitoring, key stakeholders (e.g. municipal government, fisheries cooperatives, port authority) who would be able to talk knowledgeably and in-depth about sub-seabed CO_2 storage in Tomakomai (and also give insights into perceptions of CCS held by the wider community) were sampled. To give a broader sense of environmental and social context within which the Tomakomai project takes place, these were supplemented with interviews with comparable stakeholders in nearby cities and also with policymakers at the regional level. For balance, academics and non-governmental organisations (NGOs) independent of the project, who would be able to discuss monitoring and socio-political challenges around CCS more critically, were also interviewed. The overall aim of sampling was hence to elicit a broad range of perspectives on the social, political, cultural and economic context within which the Tomakomai project developed.

A full list of people interviewed is provided in Table 1. In total, 30 people were interviewed across 17 interviews. Whilst this may seem like a small sample, given the new and potentially unfamiliar nature of CCS technology in Japan and the research aim of identifying challenges and nuances for extant SIA procedures, working intensively with a smaller range of participants who would be able to give in-depth insight into the social context in Tomakomai (c.f. Chase, 2005) was considered to give richer and more valuable data than a more extensive sample of people with more limited knowledge. In any case, samples of this size have been considered appropriate in analogous qualitative marine governance research, especially when combined with documentary methods as outlined in Section 4.2. (e.g. Kahmann et al, 2015; Fraser et al, 2017).

Organisation/expertise	Location	Number of people	Sector
Japan CCS Company Head Office	Tokyo	3	Developer
Tomakomai City Government, Industrial Development Section	Tomakomai	2	Local government
Japan CCS Company Site Manager	Tomakomai	1	Developer
Regional climate change NGO	Maebashi	1	NGO
National climate change NGO	Tokyo	1	NGO
Academic specialising in geophysics for subsea activity	Tokyo	1	Academia/research
Tomakomai Port Authority	Tomakomai	2	Public sector
Hokkaido Government, Environment and Energy Group	Sapporo	2	Regional government
Hokkaido Government, Climate Change Mitigation Group	Sapporo	3	Regional government
Tomakomai City Government, Industrial Development Section	Tomakomai	3	Local government
Tomakomai Fisheries Cooperative	Tomakomai	2	Cooperative
Regional environmental NGO	Sapporo	1	NGO
Yubari City Planning Department	Yubari	1	Local government
Community group	Yubari	3	NGO
Muroran Port Authority	Muroran	1	Public sector
Regional development association	Tomakomai / Sapporo	1	NGO
Academics specialising in geology for subsea activity	Kyoto	2	Academia/research

Table 1: List of interviewees sampled.

All interviews were undertaken in Japanese. The interviews were semi-structured, with flexibility to follow up on issues participants themselves deemed to be significant rather than those the researchers assumed to be of importance. Nonetheless, each interview sought to cover (a) the respondents' knowledge of and views on CCS; (b) their opinions on climate change and environmental issues in the locality and Japan more widely; (c) their insights into the socio-cultural situation in Tomakomai and southern Hokkaido (or, for interviewees based further away, more general thoughts on the relationship between energy infrastructure and the sea in Japan); and (d) the specific relationship of the respondents' sector to CCS (e.g. opportunities and challenges CCS raised for port activities or fisheries). A sample interview schedule is included as Supplementary Material. Analysis proceeded by drawing the main points out of each interview, and clustering these into thematic groups through a grounded theory approach (Strauss and Corbin, 1997). This clustering exercise acted as a heuristic tool to enable the research team to identify key issues around SIA in coastal regions arising from the data. In Section 5, the interviews in which the points raised were made are denoted in footnotes.

4.2. Archive research

Archival research was undertaken at Tomakomai City Library and Hokkaido Library, to understand the environmental history of the area as well as social and economic trends over time. Table 2 lists the sources consulted and their justifications. The aim of this was to obtain additional explanation on the history of infrastructure development in the environment in Tomakomai, which may inform or explain present-day attitudes to the CCS project.

Material	**Document Type**	**Location**	**Justification**
Tomakomai Minpo newspaper, 1960s-present	Local newspaper	Tomakomai City Library	Local newspaper shows historical social context of infrastructure and environmental issues.
Environmental Impact Assessments for Tomatoh-Atsuma Coal Power Plant; Idemitsu Refinery; and East Tomakomai Industrial Area	Environmental Impact Assessments	Tomakomai City Library	Historical EIAs give insight into previous environmental issues in Tomakomai, and also social licence of industries/operators now perceived as related to CCS.
Local government	Local government	Tomakomai City	Historical context of

reports on marine pollution (1920s-present)	environmental data and reports	Library	marine pollution - especially fisheries - indicates potential perceived social impacts from CCS.
Tomakomai City Census (1976-present)	Local government census	Hokkaido Library, Sapporo	Understand social trends (e.g. employment, income) in Tomakomai over time.
Hokkaido Census 2015	Prefectural census	Hokkaido Library, Sapporo	Understand wider trends in Hokkaido within which Tomakomai developments occur.

Table 2: Documentary sources consulted in archives.

Using the Prior (2003) methodology for documentary analysis of understanding both the content of the document itself and also the wider social context within which it was produced, documents were both sampled and analysed. This involved looking for material and extracts within them that helped to explain the changing relationship in Tomakomai between the community, industrial infrastructure and the sea, based on themes raised in the interviews or in the existing marine social science research reviewed in Section 2. Indicative extracts or quotes from the sampled documents were noted, and where appropriate are cited in Section 5 to support or evidence the points being made.

5. Findings

5.1. Overall citizen and stakeholder response to the Tomakomai CCS project

On the whole, the interviews and documentary analysis suggest a generally neutral stance towards the CCS project within Tomakomai, and also Hokkaido and Japan more widely. At the very least, no strong or vocal opposition to CCS activities in Hokkaido was encountered, and key stakeholders[1] indicated the community understood the nature and rationale of the project. Likewise, regional- and national-level NGOs expressed a neutral stance towards the Tomakomai project and to CCS as a system[2]. The reasons for this are evaluated in more depth in Section 5.2.

It is worth noting, however, the significance of fisheries to Tomakomai, and thus the importance of the views of fisheries cooperatives on the CCS project. Fisheries are very important socially, culturally and economically across all of Japan (e.g. Makino and Matsuda, 2005), hence fisheries cooperatives hold much political sway as to whether projects are able to proceed. Interviewed fisheries cooperative managers in Tomakomai understood the need for CCS as a climate change mitigation technology, noting that ocean acidification and environmental changes attributable to climate change have potential to affect fish stocks in Hokkaido waters and thus that mitigating actions are necessary[3]. However, there was also concern among fishers over the potential effect from any leakage of stored CO_2. This concern can be understood if one looks at the history of Tomakomai, as documented in sampled archive material. Links between pulp discharges from the Oji Paper factory in Tomakomai and the die-off of fish stocks were investigated earlier in the 20th Century (Hokkaido Government Fisheries Research Station, 1953), with compensation issues being negotiated for several decades (Tomakomai Minpo, 1974; Horie, 1982). Dumping of mud and sand from the excavation of the Tomakomai west port extension in the 1970s (to allow larger ships to berth for petrochemical import and export) was alleged to have had negative effects on the Sakhalin Surf Clam population of Tomakomai Bay (Tomakomai Minpo, 1970). Large-scale

---

1 e.g. interviews with project operator, Tokyo, June 2014; municipal government industrial location promotion division, Tomakomai, May 2016; Tomakomai port authority, Tomakomai, May 2016.

2 e.g. interviews with national climate change NGO, Tokyo, April 2016; regional development organisation, Sapporo, May 2016.

3 Interview with fisheries cooperative, Tomakomai, May 2016.

infrastructure developments in east Tomakomai City in the late 1960s and early 1970s (for instance port expansion, construction of a coal-fired power plant, construction of aluminium works) sparked organised protests in the city from fishers (Horie, 1982). Fishers in Tomakomai hence have previous experience with development and industrial pollution caused by other users of the sea, which is viewed as having negatively affected fisheries to the benefit of other sectors. This historical context was explicitly cited by interviewed fishers as grounds for being cautious about - if not opposed to - sub-seabed CO_2 storage[4].

In short, community and stakeholder responses towards the Tomakomai CCS project may best be characterised as neutral or cautiously supportive. The social and cultural significance of fisheries in the city, coupled with a historical context of debate over who benefits from industrial development in the sea, does however mean this support is qualified. Equally, though, the fact the project has been able to proceed into the execution stage does indicate operators and decision-makers have had success in balancing the interests of key stakeholders. The article now assesses in more depth how the conditions for this support may have emerged.

5.2. Why has the Tomakomai project progressed this far without any significant social acceptance issues?

Aside from the cautious attitude of the fisheries cooperatives described above, citizens and stakeholders close to Tomakomai appear to be neutral towards the CCS project. This may be due to several reasons. Just as understanding the historical context of the community's relationship with the sea helps to understand present-day cautions, so understanding the

[4] Interview with fisheries cooperative, Tomakomai, May 2016.

historical nature of community relations with industrial operators helps to explain why the CCS project is tolerated.

First, apart from the more historical concerns around fisheries, Tomakomai City has had generally positive recent experiences with industry and the organisations operating it. Heavy industry first appeared in Tomakomai in the late 1960s as part of regional development plans and was met with citizen concern over potential pollution (e.g. Tomakomai Minpo, 1969). Yet interviewees reported that these initial concerns over the coal power plant, oil storage and oil refinery developed to the east of the city have - at a local level at least – not materialised[5]. Interviewees indicated that since then, the operators of energy-related infrastructure in Tomakomai - many of whom are also involved in the CCS project - have come to be seen as 'good and trusted' employers in the city with a long record of conducting operations safely[6]. As such, it may be the case that the 'social licence to operate' (Prno and Slocombe, 2012) that operators of petrochemical activities in Tomakomai have developed over preceding decades has to an extent been carried over to the CCS project, which uses the same physical location as existing petrochemical operations for capture and injection processes. In other words, offshore CCS may be viewed by citizens and key opinion-shapers (e.g. local government) as a continuation of existing oil and gas operations in the sea, which have proceeded safely to date in Tomakomai, as opposed to a completely new activity.

Second and related, industry has to an extent become a source of pride and identity for Tomakomai and the wider Iburi Region in which it is located. Tomakomai and neighbouring Muroran are described as *kigyoujokamachi* (industrial towns, literally: towns under the castle

[5] Interview with regional development organisation, Sapporo, May 2016.
[6] E.g. interviews with project site manager, Tomakomai, August 2014; municipal government industrial location promotion division, Tomakomai, August 2014.

of industry)[7] whose locations have allowed them to develop an identity as coastal industrial towns. There is thus familiarity with and even pride in industrial operations in and around the sea, as evidenced by the inclusion of the Oji Paper factory's red-and-white cooling tower in promotional material produced by Tomakomai City (2015). Nevertheless, with regional industries such as steel manufacturing, shipping and paper manufacturing facing challenges, CCS and offshore CO_2 storage may come to be understood as a way of sustaining the city's identity as a coastal industrial town into the future[8], and indeed in building regional pride by positioning Tomakomai as a national leader in climate change mitigation technology[9].

A third driver in building support for CCS operations is trust in local (i.e. municipal) government. This appears especially crucial in gaining and sustaining consent from fisheries. Tomakomai City Government, in particular the Industrial Location Promotion Division, plays a major role in raising citizen awareness of CCS through provision of injection and monitoring data at the entrance of the City Hall. Local government officials and scientists from research institutions involved in seabed monitoring around the storage site (e.g. the Marine Ecology Research Institute) are well-known to fishers, explaining the progress of CO_2 storage operations through regular face-to-face meetings at the fisheries cooperative offices[10]. Interviewed fisheries cooperative managers likewise spoke positively about the work that key figures within the Industrial Location Promotion Division had undertaken to engage with them around the CCS project, seeing the character and interpersonal skills of these local government staff as a particular strength[11]. Consistent with social science research conducted in other coastal contexts (e.g. McKechnie, 1996; Mabon and Kawabe, 2017), the fact that

---

[7] Interview with port authority, Muroran, May 2016.

[8] Interview with port authority, Tomakomai, May 2016.

[9] e.g. interviews with project operator, Tokyo, June 2014; municipal government industrial location promotion division, Tomakomai, May 2016; port authority, Tomakomai, May 2016.

[10] Interview with fisheries cooperative, Tomakomai, May 2016; municipal government industrial location promotion division, Tomakomai, May 2016.

[11] Interview with fisheries cooperative, Tomakomai, May 2016.

municipal government officials live and work within the community, and hence themselves bear any potential risks from developments, may mean they come to be seen as reliable and trustworthy sources of information for citizens and stakeholders to reach their own informed decision on a proposed development.

A fourth driver for CCS support in Tomakomai may be the area's wider context of low-carbon energy development, and emerging awareness of the effects of climate change on Hokkaido. Tomakomai and the surrounding area have seen significant developments of mega-solar, and more recently biomass and hydrogen fuel trials[12]. It is hence possible that there is already experience of 'new' low-carbon energy technologies appearing around the city. Likewise, interviewees noted increasing prominence of climate issues in Hokkaido such as differences in weather patterns[13], changes in marine wildlife[14] and the development of prefectural government policy and citizen education initiatives[15]. All of this means that the Tomakomai CCS project comes against a much bigger backdrop of low-carbon energy deployment - and emerging awareness of the need for climate change mitigation - in the area. In turn, it may be that CCS is viewed as just one part of this 'bigger picture' of reducing the impacts of climate change on a coastal environment rather than as something separate and distinct.

Sections 5.1. and 5.2. illustrate that context matters when it comes to understanding the social dynamics of sub-seabed CO_2 storage - and indeed infrastructure issues in coastal regions more widely. The significance of historical context in explaining societal responses to infrastructure is of course not new (e.g. Bickerstaff, 2012; Bradbury, 2012) and is borne out by this Tomakomai data. What may be more challenging, though, is to integrate this rich and context-

---

12 Interview with municipal government industrial location promotion division, Tomakomai, May 2016; interview with Hokkaido Government Energy Division, Sapporo, May 2016.

13 Interview with regional environmental NGO, Sappporo, May 2016.

14 Interview with fisheries cooperative, Tomakomai, May 2016.

15 Interview with Hokkaido Government Climate Change Division, Sapporo, May 2016.

specific background into more formalised impact assessment processes. Section 6 reflects on what the implications of these findings may be for coastal social impact assessment processes.

5.3. Challenges and points of caution

Whilst the demonstration phase of the Tomakomai CCS project appears to be progressing without major opposition, it is important to draw out socio-political challenges to up-scaling offshore CO_2 storage in Japan which arose from the data. One issue is that whilst local stakeholders and community members are willing to engage with the idea of CCS, national-level opinion shapers may be more cautious. Although interviewed NGOs generally took a neutral stance towards CCS itself, they expressed concern over Japan's plans to increase its fleet of coal-fired power stations, the possible connections between CCS and coal-fired electricity generation, and by extension the climate risks of keeping coal in Japan's energy mix[16]. Opposition to further offshore CCS development may thus not come from concerns over techno-scientific risks at the local level, but rather from political concerns at a national scale - especially if CCS is perceived as perpetuating a fossil fuel-based energy system and/or economy.

Another challenge to draw out is the risk of perpetuating a relationship of dependency between a region and heavy industrial and/or undesirable infrastructure, versus the potential for CCS to act as a bridge to a more sustainable regional future. Tomakomai and southern Hokkaido more widely rely heavily on industry for employment and economic benefit, with neighbouring cities like Muroran and Yubari already feeling the negative effects of a decline

[16] Interview with regional climate change NGO, Maebashi, May 2016; interview with national climate change NGO, Tokyo, May 2016.

in steel manufacturing[17] and coal mining[18] respectively. Blowers (1999) argues this reliance can make it hard for policymakers in physically remote and potentially economically marginalised communities of this nature to say 'no' to further industrial developments, hence it could be argued CCS risks perpetuating a relationship of dependency on carbon-intensive industries in already peripheral or marginalised locations. Caution must thus be exercised to ensure that something like the CCS project fits with citizens' views on what a socially sustainable future for Tomakomai City looks like, and to imagine alternative visions of a managed transition which may not rely on heavy industries (the solar power and biomass projects in Tomakomai may be two examples of this). Equally, though, in coastal areas like Tomakomai, it may be possible to frame CCS as part of a managed transition away from a fossil fuel-dependent economy, following 'just transitions' thinking seen in Australia (Evans and Phelan, 2016) and Scotland (Mabon and Littlecott, 2016). CCS may thus gain traction as a framing that allows the economic base of coastal industrial regions in Japan like Tomakomai to avoid a sharp and sudden loss of emission-intensive industries (and associated negative economic effects at the local level) whilst still contributing to climate change mitigation. This may be especially significant to coastal industrial cities in Japan, where the nature of geology and dense population means CO_2 storage will most likely have to be offshore.

6. Discussion and policy implications

To conclude, the article reflects on challenges the Tomakomai CCS case raises for undertaking SIA in coastal regions. Five points are identified where the lessons learned from the social dynamics of the Tomakomai project may build, nuance or reinforce Vanclay's (2012) principles for SIA in coastal management. These are intended to draw developers',

[17] Interview with port authority, Muroran, May 2016.
[18] Interview with city planner, Yubari, May 2016.

municipal government and national regulators and policymakers' attention to dimensions which may require particular attention when undertaking coastal SIA or developing SIA requirements within marine policy frameworks.

First, Vanclay (2012: 152) indicates “environmental (biophysical) impacts only occur when the first sod of soil is turned; social impacts occur the moment there is speculation or rumour that something will change”. However, the Tomakomai CCS project demonstrates it may be challenging to identify 'new' social impacts when the project is an extension or development of existing activity in an area. Whilst sub-seabed CO_2 storage is novel to Tomakomai and Japan, many of the companies who have a role operating the project have been refining petrochemicals and transporting oil by sea for several decades. As such, the social dimensions of CO_2 storage are inevitably connected to the economic benefits, social trust and cultural change arising from existing oil and gas operations in Tomakomai. The challenge this raises for those undertaking SIA in other contexts is to pay cognisance to which social impacts may be a continuation of existing activities, versus which are a direct result of new phases of a development. Moreover, in situations where a new phases of development such as CO_2 storage may give rise to new perceived risks, there may be a need for regulators to ensure operators undertake sufficient communication and engagement to ensure communities are aware of how a new phase of a development may differ from what has happened previously. This is especially important in a marine context where new activities may not be immediately visible or detectable to citizens or peripheral stakeholders.

Second, Vanclay (2012: 152) holds that “(p)rocess is everything. It is important to realise that the level and effectiveness of community engagement has a huge bearing on the amount of fear and anxiety experienced.” This is important and has been undertaken for Tomakomai too (e.g. Tanaka, 2014; Okajima, 2016), and reflects current thinking on offshore CCS (Mabon et al, 2015) and other marine infrastructure situations (Gray et al, 2005). Nevertheless, the Tomakomai CCS project demonstrates the importance of effective engagement into the operations phase. SIA processes may appear front-loaded towards getting a project accepted - for instance, five of seven steps in the International Association for Impact Assessment guidelines on SIA (IAIA, 2015) refer to the pre-operation phase. Yet in Tomakomai, regular face-to-face engagement with fishers by research institutions and local government officials to discuss monitoring results and requirements has been crucial in retaining support of a key stakeholder group and public opinion-shaper *after* CO_2 injection has commenced as well as consultation beforehand. The important lesson here for both operators and policymakers is to exercise caution to avoid inadvertently focusing on pre-operation community engagement, and to realise that sustained community and stakeholder engagement during the operation phase may be key to mitigating or avoiding longer-term social impacts. A marine context places particular limitations on what can be sampled and how often (due to need for boats, monitoring equipment, skills etc) and hence on what can be known with certainty. This makes rigorous monitoring and engagement to understand and explain uncertainty all the more important in sustaining societal support in a coastal or marine SIA context.

Third, Vanclay (2012: 153) advocates a “(f)ocus on what counts, not on what can be counted.” Again, the Tomakomai experience supports this assertion. More than an economically significant activity, fishing for surf clams in Tomakomai is also a source of pride, identity and historical meaning to the city. In other words, the 'value' and meaning of fisheries to Tomakomai - and thus what is perceived as being at risk from sub-seabed CO_2 storage - extends far beyond the economic contribution of fisheries to the city. However, it is also true that in the absence of formalised SIA procedures, in contexts such as Japan at least quantifiable processes like EIAs carry much more weight in evaluating the propriety or otherwise of a new development. In cases where the sea and coast - and activities taking place within them - carry significant cultural meaning which cannot so easily be quantified, it may thus be advisable to extend EIA regulations to include a fuller description of the socio-cultural context. Whilst this does not quantify 'what counts', it may at least in the short term ensure these culturally meaningful aspects are included within formalised impact assessments.

Fourth, Vanclay (2012: 152) explains "(t)he 'community' is never homogeneous." Where marine environments add complexity, however, is in the potential for currents to carry water - and material within it - over long distances. This means that effects from projects may be perceived as having the potential to affect marine environments and activities beyond those spatially adjacent to the development. In Tomakomai, for example, fisheries cooperatives operating elsewhere in the region have a keen interest in CCS project despite not fishing directly around the storage site. The challenge this raises for setting and undertaking coastal SIA is to acknowledge that understandings of 'ownership' of or interest in the sea may transcend traditional geographical boundaries. There may thus be a need to extend community engagement and impact assessment beyond the locality to encompass other coastal communities in the region with an interest in the well-being of the marine environment.

Fifth and final, Vanclay (2012: 153) observes "(t)he outflows from a site include not only the products but also the waste products and pollution *[…]* the products can often have downstream social impacts." CCS - and other low-carbon technologies like it - are challenging in this regard. On one hand, it is true that whilst the Tomakomai CCS project follows rigorous site characterisation and stringent monitoring to ensure injected CO_2 remains stored below the surface, interviewed fishers have legitimate concerns about effects on fish stocks should anything untoward occur. This may be especially pertinent in the Japanese context given the effects a *perception* of marine produce as tainted has had on Fukushima fisheries (Wada et al, 2013). Equally, however, for low-carbon technologies the negative environmental effects - or at least the perception thereof - must be balanced up against the possibility that doing nothing may be the most harmful option of all if it contributes to continued and unabated climate change. Given the vulnerability of coastal communities and seas themselves to acidification, rising sea levels and extreme weather events, policy for SIA in coastal regions may hence wish to develop provision for understanding how new developments can help to mitigate climate change impacts in the local environment.

7. Conclusion

The Tomakomai CCS Demonstration Project illustrates that community responses to a coastal infrastructure project may be complex and nuanced, requiring engagement with the social and cultural context to understand more fully. In particular, present-day stakeholder cautions can become more understandable if one considers historical relations with and experiences in the sea. Likewise, community tolerance for a potentially undesirable piece of infrastructure may make sense when one looks at how the relationship between industry, the community and the sea has developed over time, particularly with regard to relations of trust between long-standing operators, the local government and citizens. The key challenge for SIA and other policy instruments, as argued in this paper, is to find ways to incorporate and make visible this rich social context within existing environmental risk governance processes.

Acknowledgments

Special thanks are extended to Masayuki Kamada of the Industrial Location Promotion Division in Tomakomai City Government for support in arranging stakeholder interviews. The authors are also grateful to Takashi Kawabata of METI and Yutaka Tanaka and team at the Japan CCS Company for their support. Thanks are also extended to the CO_2 Storage Group at RITE for hosting Dr Mabon during his 2016 fieldwork, and to all participants in Tomakomai and beyond who were involved in the research.

Funding sources

This work was supported by a UK CCS Research Centre International Research Collaboration Fund grant held by all authors (the UKCCSRC is funded by the EPSRC as part of the RCUK Energy Programme); a Japan Foundation Fellowship held by the lead author; and a Regional Studies Association Early Career Grant held by the lead author.

References

Abe M, Saito S, Tanase D, Sawada Y, Hirama Y and Motoyama Y (2013) 'CCS Large-Scale Demonstration in Japan' *Energy Procedia* 37: 6326-6334.

Anderson C, Schirmer J and Abjorensen N (2012) 'Exploring CCS community acceptance and public acceptance from a human and social capital perspective' *Mitigation and Adaptation Strategies for Global Change* 17(6): 687-706.

Barrow CJ (1997) *Environmental and Social Impact Assessment: An Introduction* Arnold: London

Bickerstaff K (2012) ''Because we've got history here': Nuclear waste, cooperative siting, and the relational geography of a complex issue' *Environment and Planning A* 44(11): 2611-2628.

Blowers A (1999) 'Nuclear waste and landscapes of risk' *Landscape Research* 24(3): 241-264.

Boyd A (2015) 'Connections between community and emerging technology: support for enhanced oil recovery in the Weyburn, Saskatchewan area' *International Journal of Greenhouse Gas Control* 32: 81-89.

Bradbury J (2012) 'Public understading of and engagement with CCS' in Markusson N, Shackley S and Evar B (eds) *Understanding the Social Dynamics of CCS* Earthscan: London pp 45-73.

Cashmore M (2004) ‘The role of science in environmental impact assessment: process and procedure versus purpose in the development of theory’ *Environmental Impact Assessment Review* 24 (4): 403-426.

Chase SE (2005) 'Narrative inquiry: multiple lenses, approaches, voices' in Denzin NK and Lincoln YS (eds) *The Sage Handbook of Qualitative Research* Sage: Thousand Oaks CA pp 651-679.

Dawson J, Johnston ME and Stewart EJ (2014) “Governance of Arctic expedition cruise ships in a time of rapid environmental and economic change” *Ocean and Coastal Management* 89(1): 88-99.

Dowd A-M and James M (2014) 'A social licence for carbon dioxide capture and storage: how engineers and managers describe community relations' *Social Epistemology* 28 (3-4): 364-384.

Esteves AM, Franks D and Vanclay F (2012) ‘Social impact assessment: the state of the art’ *Impact Assessment and Project Appraisal* 30 (1): 34-42.

Evans G and Phelan L (2016) 'Transition to a post-carbon society: linking environmental justice and just transition discourses' *Energy Policy* 99: 329-339.

Fraser KA, Adams VM, Pressey RL and Pandolfi JM (2017) ‘Purpose, policy, and practice: Intent and reality for on-ground management and outcomes of the Great Barrier Reef Marine Park’ *Marine Policy* 81: 301-311.

Global CCS Institute (2016) *The Global Status of CCS 2016: Summary Report* GCCSI: Canberra.

Gray T, Haggett C and Bell D (2005) 'Offshore wind farms and commercial fisheries in the UK: a study in stakeholder consultation' *Ethics, Place and Environment* 8(2):127-140.

Grehan AJ, van den Hove S, Armstrong CW, Long R, van Rensburg T, Gunn V, Mikkelsen E, de Mol B and Hain S (2009) 'HERMES: promoting ecosystem-based management and the sustainable use and governance of deep-water resources' *Oceanography* 22 (1): 155-165.

Haggett C (2008) 'Over the Sea and Far Away? A Consideration of the Planning, Politics and Public Perception of Offshore Wind Farms' *Journal of Environmental Policy & Planning* 10 (3): 289-306.

Hall N, Lacey J, Carr-Cornish S and Dowd A-M (2015) ‘Social licence to operate: understanding how a concept has been translated into practice in energy industries’ *Journal of Cleaner Production* 86: 301-310.

Haug JK and Stigson P (2017) ‘Local acceptance and communication as crucial elements for realizing CCS in the Nordic region’ *Energy Procedia* 86 (2016): 315-323.

Hokkaido Government Fisheries Research Institute (1953) *Damage to Fisheries from Tomakomai Oji Paper Factory Waste Water: Survey Summary Report* Hokkaido Government Fisheries Research Institute: Hakodate.

Horie T (1982) *Issues around compensation and pollution for fisheries in Tomakomai Port* (in Japanese) Tomakomai City Government: Tomakomai.

International Energy Agency Greenhouse Gas R&D Programme (2017) *Capture and storage of CO2* IEAGHG: Cheltenham.

International Association for Impact Assessment (2003) *International Principles for Social Impact Assessment* IAIA: Fargo, ND

International Association for Impact Assessment (2015) S*ocial Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects* IAIA: Fargo, ND

Jabour J (2010) 'Biological prospecting: the ethics of exclusive reward from Antarctic activity' *Ethics in Science and Environmental Politics* 10: 19-29.

Japan CCS Company (2017) 'Tomakomai CCS Demonstration Project' Available: http://www.japanccs.com/en/business/demonstration, accessed 11/06/2017

Kahmann B, Stumpf KH and Baumgartner S (2015) ‘Notions of justice held by stakeholders of the Newfoundland fishery’ *Marine Policy* 62: 37-50.

Kaiser M, Brunsting S, Mastop J, Zimmer R, Shackley S, Mabon L and Howell R (2015) 'CCS acceptability: social site characterization and advancing awareness at prospective storage sites in Poland and Scotland' *Oil and Gas Science and Technology* 70 (4): 767-784

Mabon L, Shackley S, Blackford J, Stahl H and Miller A (2015) 'Local perceptions of the QICS experimental offshore CO2 release: results from social science research' *International Journal of Greenhouse Gas Control* 38: 18-25

Mabon L and Littlecott C (2016) 'Stakeholder and public perceptions of CO2-EOR in the context of CCS - results from UK focus groups and implications for policy' *International Journal of Greenhouse Gas Control* 49: 128-137

Mabon L and Kawabe M (2017) ' 'If over a hundred Becquerels is no good, then what does fifty Becquerels mean?' Governing fisheries and marine radiation in Japan after the Fukushima nuclear accident' in Baghel R, Stepan L, and Hill J (eds) *Water, Knowledge and the Environment in Asia: Epsitemologies, practices and locales* Earthscan: London pp 19-35.

Makino M and Matsuda H (2005) 'Co-management in Japanese coastal fisheries: institutional features and transaction costs' *Marine Policy* 29(5): 441-450.

McKechnie R (1996) 'Insiders and outsiders: identifying experts on home ground' in Irwin A and Wynne A (eds) *Misunderstanding Science? The Public Reconstruction of Science and Technology* Cambridge University Press: Cambridge pp 126–151.

Milligan B (2014) 'Planning for offshore CO_2 storage: Law and policy in the United Kingdom' *Marine Policy* 48: 162-171.

Okajima T (2016) ‘Present status and future challenges of CCS in Japan’ 13th Conference on

Greenhouse Gas Control Technologies, Lausanne, Switzerland, 17 November 2016. Available: http://www.ghgt.info/images/GHGT13/2_Takuro_Presentation.pdf, accessed 11/06/2017.

O'Faircheallaigh C (2010) ‘Public participation and environmental impact assessment: Purposes, implications, and lessons for public policy making’ *Environmental Impact Assessment Review* 30 (1): 19-27.

Partain RA and Faure MG (2016) ‘Development of a Regulatory Framework for CDM-Enabled Offshore Carbon Capture and Storage (OCCS) in China’ in Weishaar S and Philipsen N (eds) *The Rise of the Regulatory State: The U.S., E.U. and China’s Theory and Practice* Edward Elgar: Cheltenham. Available at SSRN: https://ssrn.com/abstract=2794676

Prior L (2003) *Using Documents in Social Research* Sage: Thousand Oaks, CA.

Prno J and Slocombe DS (2012) 'Exploring the origins of 'social license to operate' in the mining sector: Perspectives from governance and sustainability theories' *Resources Policy* 37(3):346-357.

Proelss A and Gussow K (2011) 'Carbon capture and storage from the perspective of international law' in Herrmann C and Terhechte JP (eds) *European Yearbook of International Economic Law* Springer: New York pp 151-168.

Roche C and Bice S (2013) 'Anticipating Social and Community Impacts of Deep Sea Mining' in Baker E, Beaudoin Y and Pendleton L (eds) *Deep Sea Minerals: Deep Sea Minerals and* *the Green Economy* Duke Nicholas Institute for Environmental Policy Solutions: Durham, NC.

Roman M (2011) ‘Carbon capture and storage in developing countries: A comparison of Brazil, South Africa and India’ *Global Environmental Change* 21(2): 391-401.

Rooney D, Leach J and Ashworth P (2014) 'Doing the social in social licence' *Social Epistemology* 28(3-4):209-218.

Scott V, Haszeldine RS, Shackley S, Gilfillan SMV, Mabon L and Johnson G (2014) 'North Sea: carbon dioxide storage is secure' *Nature* 506:34.

Side J (1997) 'The future of North Sea oil industry abandonment in the light of the Brent Spar decision' *Marine Policy* 21(1): 45‑52.

Smith G and Brennan RE (2012) 'Losing our way with mapping: thinking critically about marine spatial planning in Scotland' *Ocean and Coastal Management* 69: 210-216.

Slootweg R, Vanclay F and van Schooten M (2001) ‘Function evaluation as a framework for the integration of social and environmental impact assessment’ *Impact Assessment and Project Appraisal* 19: 19-28.

Strauss A and Corbin J (1997) *Grounded Theory in Practice* Sage: Thousand Oaks, CA.

Tanaka Y, Abe M, Sawada Y, Tanase D, Ito T and Kasukawa T (2014) 'Tomakomai CCS

Demonstration Project in Japan, 2014 Update' *Energy Procedia* 63: 6111-6119.

Tomakomai City (2015) *Industrial Sightseeing Guide* Tomakomai City: Tomakomai http://www.hokkou-p.com/ebook/t/kankou-k/_SWF_Window.html accessed 11/06/2017.

Tomakomai City (2016) *Tomakomai City Census: Heisei 28 Version* (in Japanese) Tomakomai City: Tomakomai. http://www.city.tomakomai.hokkaido.jp/files/00006300/00006397/toukeisyoH28.pdf, accessed 11/06/2017.

Tomakomai Minpo (1969) 'Doubts remain over environmental protection: focus on residents' consent for the Tomakomai basic vision' (in Japanese) *Tomakomai Minpo* July 1969: p1.

Tomakomai Minpo (1970) 'Decision on opposition to construction of second industrial port etc - the first large fishers' gathering in Tomakomai' (in Japanese) *Tomakomai Minpo* March 19 1970: p5.

Tomakomai Minpo (1974) 'Request for damages from Oji Paper? Contamination of Tomakomai fishing grounds: Tomakomai fisheries cooperative considering on basis of survey results' (in Japanese) *Tomakomai Minpo* April 24 1974: p2.

Vanclay F (2012) 'The potential application of social impact assessment in integrated coastal zone management' Ocean and Coastal Management 68: 149-156.

Wada T, Nemoto Y, Shimamura S, Fujita T, Mizuno T, Sohtome T, Kamiyama K, Morita T and Igarashi S (2013) 'Effects of the nuclear disaster on marine products in Fukushima'

Journal of Environmental Radioactivity 124:246-254.

Wiersma B and Devine-Wright P (2014) 'Public engagement with offshore renewable energy: a critical review' *Wiley Interdisciplinary Reviews: Climate Change* 5(4): 493-507.

Challenges for social impact assessment in coastal regions: a case study of the Tomakomai CCS Demonstration Project

Supplementary Information – General Interview Schedule

1. Context and history

(a) Tell me about your organisation

(i) When was it founded?

(ii) What is its purpose?

(iii) How does it relate to the environment and climate change?

(iv) etc

(b) Tell me about the current social situation of the city (Tomakomai/Muroran/Yubari etc)

(i) Employment base?

(ii) General economic situation?

(iii) Cultural situation/activity?

(c) Tell me about the history of the city (Tomakomai/Muroran/Yubari etc)

(i) How has the economic and employment base changed over time?

(ii) How has the city expanded/developed over time?

(iii) How do you think society and culture has changed over time in the city?

2. Environment and climate issues

(a) What environmental issues are you/your organisation facing at the moment?

(i) How have things changed in the last 10-20 years?

(ii) Are there any issues that are going to become a bigger problem into the future?

(b) How does climate change fit into these?

(i) How has the climate changed in the last 10-20 years?

(ii) What effects do you expect to see from now into the future?

(c) What policies or countermeasures are you/your organisation taking against climate change?

(i) Regulations?

(ii) Policies?

(iii) Anything you are especially concerned about?

3. CCS and low-carbon energy infrastructure

(a) Tell me what you know about CCS?

(b) Based on what you know, what benefits do you think CCS could bring:
- (i) To your organisation;
- (ii) To this region (e.g. hotels, income etc)?
- (iii) To Japan in general?

(c) What other energy or large infrastructure projects are going on in the area just now?
- (i) How do you think these might affect your organisation?
- (ii) How do you think the community feels about them? Why?
  - (ii) Do you know if anything is planned for the near future?